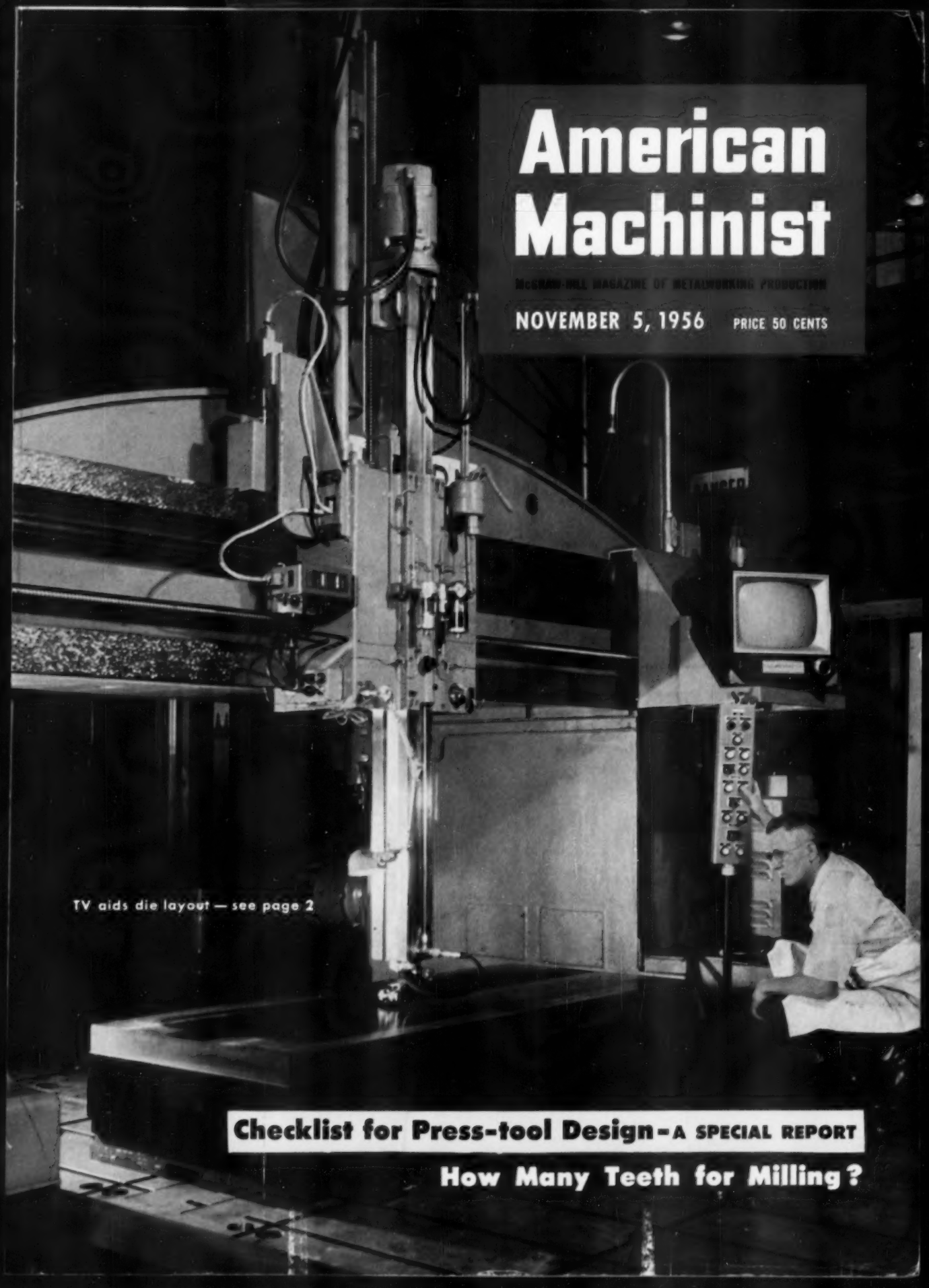


American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NOVEMBER 5, 1956 PRICE 50 CENTS

TV aids die layout — see page 2

Checklist for Press-tool Design – A SPECIAL REPORT

How Many Teeth for Milling?

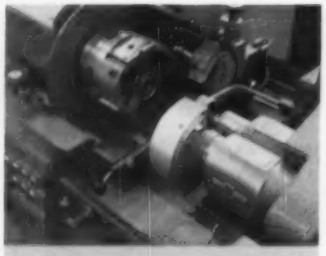
8 Ways to COMBINE

BORE and FACE GRINDING OPERATIONS

with Heald Multi-Spindle Internals

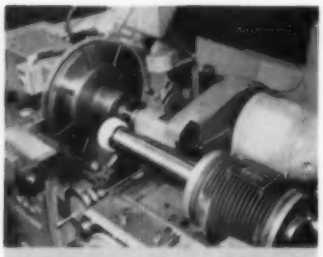
SIMULTANEOUS Bore and Face Grinding with SLIDE-BAR FACING

Bore grinding wheel reciprocates with table while facing wheel, mounted on anti-friction slide bars, is held forward against work under spring pressure. Face feeding stop controls depth of face grind.



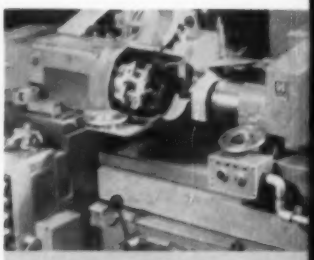
SEQUENTIAL Bore and Face Grinding with MANUAL FACING

Face is first plunged with manual facing attachment, while bore wheel enters bore without contacting work. Bore is then ground in Size-Matic cycle (facing wheel positioned to clear work on instroke).



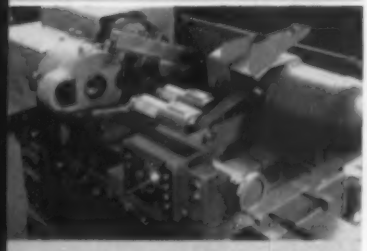
SEQUENTIAL Bore and Face Grinding with RETRACTABLE FACING HEAD

With motorized facing wheelhead in extended position, face is plunge ground with manual feed (bore wheel is clear of work). Workhead is indexed forward and bore ground in Size-Matic cycle.



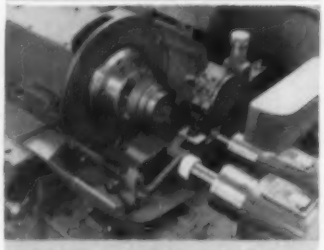
SIMULTANEOUS Bore and Bottom Face Grinding with SINGLE WHEELHEAD

Combined bore and facing wheel feeds against work while workhead feed is operating, grinding face to finish size and plunging bore to semi-finish size. Wheel plunges bore to finish size while held clear of face.



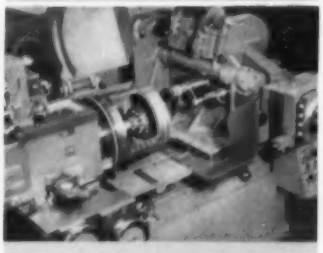
SEQUENTIAL Grinding of Two Bores and Bottom Face with SPACED WHEELHEADS

Small bore first ground to size (second wheel clears work), then workpiece is indexed forward in front of second wheel. Large bore is plunge ground and at some time wheel is fed forward to face grind bottom face.



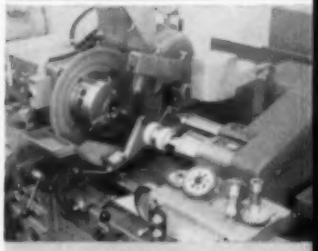
SEQUENTIAL Bore and Bottom Face Grinding with SPACED WHEELHEADS

With workhead in rear position, bore is ground in Size-Matic cycle (facing wheel spaced to clear work). Work is then indexed forward and face is plunge ground to finish size, (bore wheel clears work).



SEQUENTIAL Plunge Grinding of STRAIGHT AND CONTOUR BORES

Two wheelheads first plunge grind large straight bore and spherical ball race. Work is then indexed forward and small combined straight and taper bores are plunged with shaped wheel.

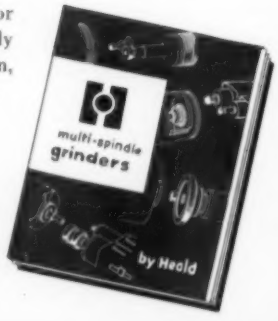


SEQUENTIAL Grinding of I.D., O.D. and FACE with Spaced Wheelheads

Bore is first ground to finish size with workhead in rear position (face and O.D. wheels clear of work). Workhead indexes forward and bottom face and two O.D.'s are plunge ground with double wheel.

WHENEVER two or more grinding operations can be done at a single chucking, you convert handling time into *grinding time*. What's more, you get a more positive relationship between ground surfaces than could be obtained by any other method. Here are eight different Heald setups for performing such combined operations quickly and economically. For complete information, send for a copy of new Bulletin No. 2–69–2.

It PAYS to come to Heald!



HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NEWS REPORT ..

. . . Spot News . . 97
. . . Washington . . 99
. . . Detroit . . 101
. . . Machine Tools . . 103
. . . What's Ahead . . 107
. . . General News . . 170
. . . Names . . 180

Departments...

Letters . . 90
Editorial . . 111
Practical Ideas . . 142
Round Table . . 141
. . . Discussion . . 226
Talking Shop . . 169
New Equipment . . 180
New Bulletins . . 184c
Books . . 249

contents for November 5, 1956

VOLUME 100, NUMBER 23

Seven-phase plan can open manufacturing bottlenecks . . . A discussion of present transition from prototype to production—and a method of curing some headaches. *By Pilson W Kelly, Ford Instrument Co.* **113**

One setup completes secondary operations . . . a technique to complete slotting and other secondary operations on the automatic **116**

How many teeth for the best milling cutter? . . . Tests show one or two teeth require the least horsepower, give as good a finish. *By John F Lipscomb and O D Lascoe, Purdue University* **118**

Simple setups solve serious shop problems . . . Tricky methods in a small shop to deal with tight tolerances and tough materials. *By William M Stocker, Jr.* **120**

Cold bend coaxial tubing . . . Two alloy tubes, one inside the other, are bent simultaneously to form 8-coil coaxial tube. Sand is the secret. *By J P Le Blanc, Taylor Engineering Co.* **124**

Two precision-tube tooling techniques . . . An automatic shear cuts without burr or loss of accuracy; cast corners eliminate tubing welds on electronic equipment **126**

New techniques build '57 cars, III . . . Best new ideas from the auto industry's billion-dollar tooling program, concluded. *By George De Groat and Ben C Brosheer* **145**

Machines assemble fuel pumps **145**
Integrated lines finish die castings **146**
Electronics spark production-line scheduling **148**
Mechanized forming and welding streamline output **150**
Middle-ground automation for the Torque-Flite **153**
Velocity trenches remove chips and coolant **154**
Planet pinion production is highly automated **155**
Automated machines make annulus gears **157**
Shop made automation speeds over-running cam production **158**
Skate-wheel chutes move steel shafts **159**
Blasting deburrs CI and aluminum parts **159**
Diamond-tipped face mills finish aluminum valve bodies **160**

SPECIAL REPORT NUMBER 433

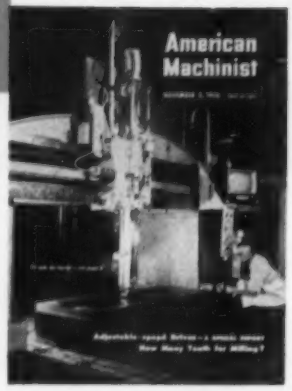
Checklist for press-tool design . . . To minimize errors and oversights, these searching questions cover all phases of the nine basic factors in the design of press tools. *By G R Tindale* **129**

REFERENCE BOOK SHEETS

Profile turning slide I, II . . . *By S R Rosen, U S Automatic Corp.* **163**

Milling titanium with carbide . . . *By John Begle, Detroit Milling Cutter Co.* **167**

American Machinist *Chips*



Cover . . .
Layout of a forging die at Alcoa's Cleveland plant is aided by TV to show vernier readings to the operator. Details on this Colburn machine are at left.

Heavy press accessory . . . The Air Force Heavy Press Program involves much more than 35,000- and 50,000-ton presses that draw the bulk of the attention. Since we first described the accessory equipment (*AM*—May 23 '55, p180), an important addition has been made to Air Force Plant 47, operated by the Aluminum Co of America in Cleveland. This is a Colburn die-layout machine built by Consolidated Machine Tool Div of Farrel-Birmingham Co, Inc. It was designed jointly by Alcoa and Consolidated.

Die blocks up to 30 tons per half are used on the heavy presses in the plant, and crane and machine capacity have been designed to handle 100 tons per block. The die shown on the Colburn machine on our cover is a fairly small one: 33½x16x72 in. Blocks are chrome-nickel-moly or chrome-moly steel. Contours are laid out on X, Y, and Z axes, using a gantry with a head on a cross rail and a ram in the head. Verniers are mounted relative to the die block.

Three television cameras pick up the verniers for the three motions and transmit them to a 17-in. RCA television set mounted on the operating platform. The TV set has three channels, one for each vernier, selected by a conventional channel-tuning dial. The image is multiplied 10 times in transmission. In this way the operator can see the exact height, longitudinal, and traverse positions.

A sharp-edged steel roller with hardened and bevelled edges is one scribing tool. Pressure of the wheel can be adjusted to suit the die block. Centering drills and cutters for point-milling lines are held in a spindle with speeds of 35 to 3500 rpm. Feed and traverse are adjustable from 0.5 to 200 ipm. Thus inching is possible in 0.0005-in. increments.

As the last of the 1957 cars are introduced, we bring the third and final installment of our series on the new production techniques for these cars. Our aim has been to comb the industry for innovations most likely to be of use to Metalworking generally. Lest this series leave you the impression that the industry is no longer going in for automation and special machines, we include in this final report a description of some of the automated lines from Chrysler's new transmission plant in Kokomo. If you missed either of the first installments, look them up now. They are full of good ideas.

Coming . . . *AM* for Nov. 19 will describe how electrical-discharge machining is performed on radioactive metals in a "hot cave". The Special Report will be a study of the ways to find money for financing a business. Other articles include two ways to drill deep holes and two tricks in inspection.

Pilson W Kelly, . . . licensed professional engineer and certified public accountant, both in New York State, has the rare combination of financial and mechanical knowledge so important to modern management. An ME graduate of Stevens Institute of Technology, he has been associate engineer in charge of rate-case examinations for the NY State Public Service Commission and analyst for the W L Maxson Corp. In this issu , Mr Kelly discusses the relationship between design, development, and manufacturing as it affects cost and output.

ALBERT HAUPTLI publisher

BURNHAM FINNEY editor
E J TANGERMAN executive editor

ANDERSON ASHBURN managing editor
RUPERT LE GRAND senior associate editor

BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
WM M STOCKER, JR associate editor
JOHN P WRIGHT associate editor
GEORGE H DE GROAT (Detroit) associate editor

ANN McTAGUE assistant editor
TOM JOHNSON assistant editor
GOSTA WERNBERG assistant editor

RICHARD E ROOMAN art director
ANNE PALMER assistant
MATTHEW T HAGGERTY makeup

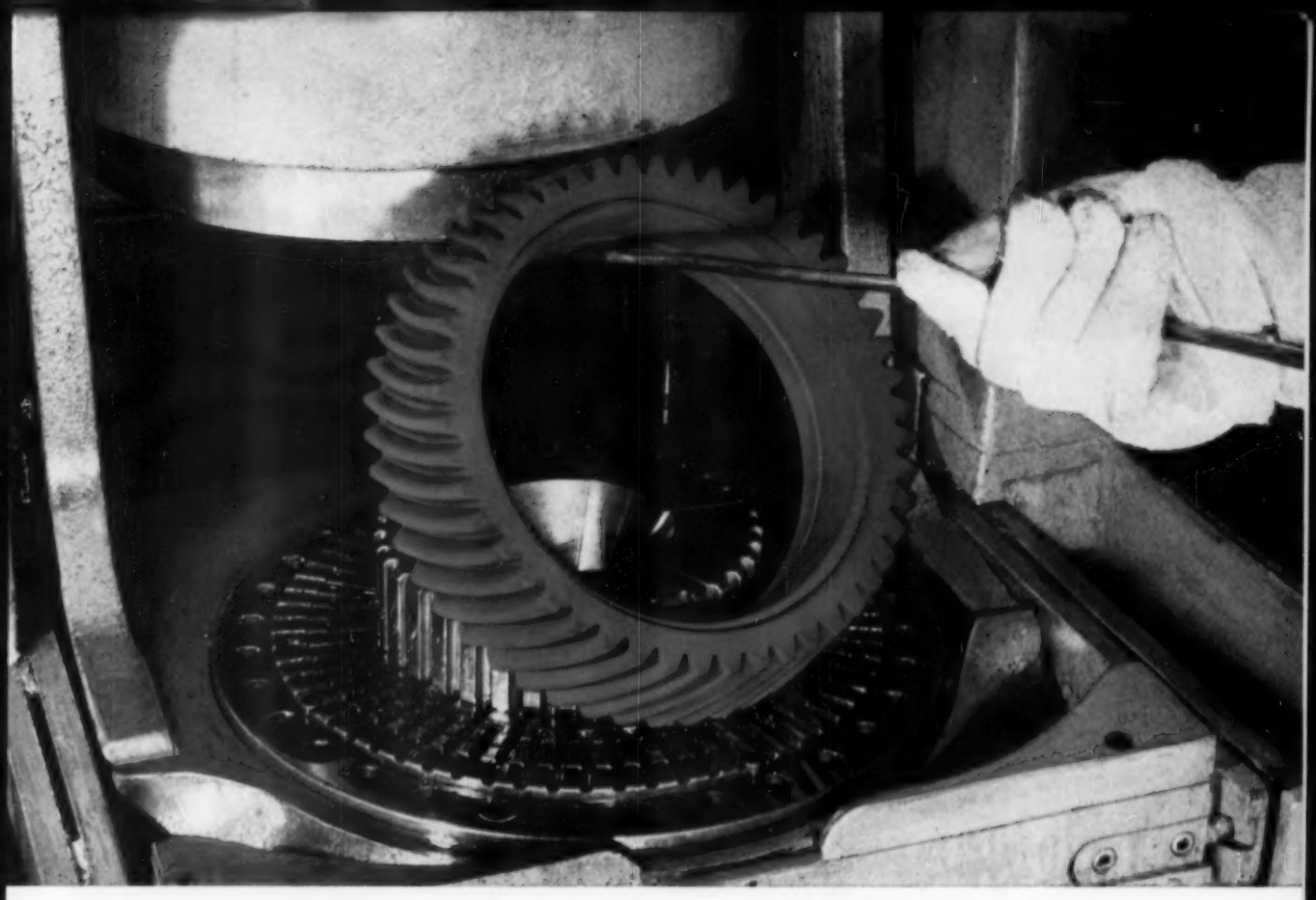
ROBERT SHEETS news editor
HARRY HOMEWOOD Detroit
ROBERT E COCHRAN Cleveland
MARGARET RALSTON San Francisco
JOHN SHINN Los Angeles
HAROLD HOOD Los Angeles
A R HENRY Atlanta
WILLIAM J COUGHLIN London
ROBERT E FARRELL Paris
PETER WEAVER Rio de Janeiro
GERALD W SCHRODER Bonn
DAN KURZMAN Tokyo
JOHN H KEARNEY Mexico City
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington bureau
JOHN WILHELM editor world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
RUSSELL T DOUGLAS business manager
CATHERINE C KANE manager, reader service

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly, with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc, James H McGraw (1860-1948), Founder.
EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, NY. Donald C McGraw President; Paul Montgomery, Executive Vice President; Joseph A Gerardi, Vice President and Treasurer; John J Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President, Director of Advertising Sales; J E Blackburn, Jr, Vice President and Circulation Director.
SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, NY. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.
Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Second-class mail privileges authorized at New York, NY.
Copyright 1956 by McGraw-Hill Publishing Co, Inc—All Rights Reserved.



How to hold close tolerances when you quench gears and other parts

If you make parts like this aircraft transmission gear, you know that warpage or distortion during quenching means losing the time and money you've spent machining the part to close dimensional tolerances.

You can avoid such costly losses with Gleason Quenching Equipment.

The hot gear above, for example, is being set on the lower die of a Gleason Quenching Press. A button is pressed and the automatic quenching cycle is started. The lower die is swung back into the quenching position and the upper die descends rapidly, aligning the part while it is still in the plastic state.

The dies securely clamp the gear, but are so designed to permit it to contract in the normal manner, while still holding the gear true.

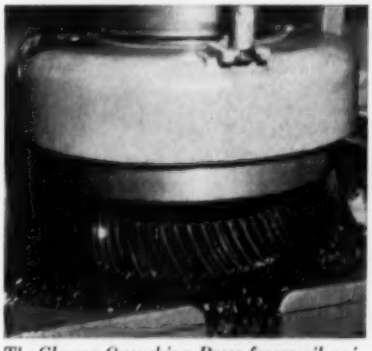
Carefully controlled metallurgically correct oil circulation hardens the gear to perfection.

Post-quench tests show the gear meets all specifications.

You can give *any* part, regardless of shape, the same distortion-free quenching.

Three sizes of the Gleason Quenching Press harden parts up to 36″ diameter. Another press automatically hardens and straightens shafts and shaft parts up to 40″ in length.

For literature and recommendations on the press and die equipment that fit your products, send us blueprints.



The Gleason Quenching Press forces oil uniformly over and around the part, assuring the correct hardness and distortion-free quenching.

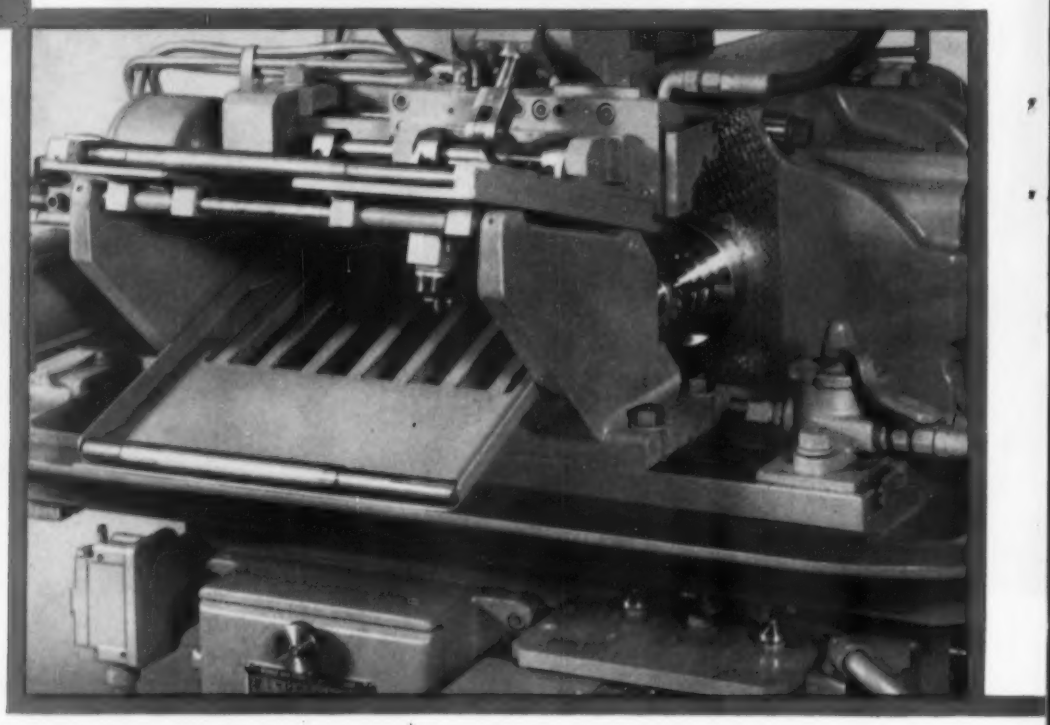
GLEASON WORKS

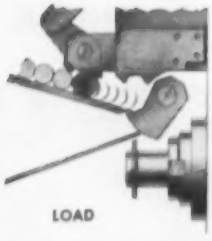
Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

CINCINNATI

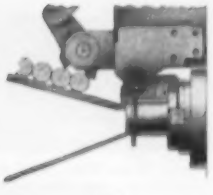
AUTOMATIC



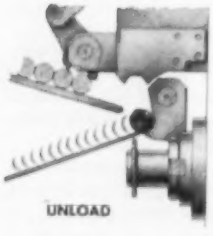


LOAD

Methods idea and one of 13 electric motor shafts automatically milled upside-down on a CINCINNATI No. 0-8 Automatic Rise-and-Fall Milling Machine. The fixture is shown in the above close-up. Production 160 shafts per hour, at 80% operator efficiency.



MILL



UNLOAD

Automatic cycle, synchronized by Cincinnati's exclusive Cycle Selector unit:

Rapid spindle carrier up	.03 min.
Feed up to depth of ⅛"	.03 min.
Feed right 1½"	.15 min.
Rapid spindle carrier down	.03 min.
Rapid right and feed to position while simultaneously and automatically unloading and loading fixture	.06 min.
Total cycle time	.30 min.

CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES

UPSIDE DOWN MILLING

Clears the Work of Chips

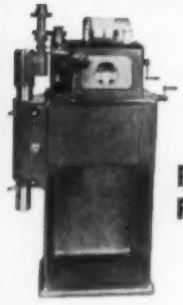
Chips are a nuisance and an expense when they litter up the work. It pays to get rid of them quickly, especially on automatic high production equipment like the Cincinnati Milling Machine illustrated here. It neatly performs an upside-down milling operation . . . the work comes clean and at a high rate of production. ¶ As you might suspect, this example of automation is the work of Cincinnati Application Engineers. They chose a CINCINNATI® No. 0-8 Automatic Rise-and-Fall for the job of milling keyways in electric motor shafts. The complete cycle is automatic, including loading, clamping and ejecting. Standard two-way feed cycle and automatic backlash eliminator are invaluable Cincinnati features in producing this job at the lowest cost. The feeding cut is the "climb" milling type, which aids in holding the work firmly in the V-locators and against an end stop. Thirteen different size motor shafts can be milled on this equipment. ¶ Cincinnati's wide experience in automatic machining operations, including conveying and transferring the work, is available for your cost-reducing program. Give us the details; you will get the benefit of the most advanced thinking in metalworking. Meanwhile, you might want to know more about CINCINNATI No. 0-8 Automatic Milling Machines. Look in Sweet's for brief specifications; a post card will bring complete information. Ask for catalog No. M-1607-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI No. 0-8
Plain Automatic Rise and Fall Milling Machine

HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

WORTH THEIR



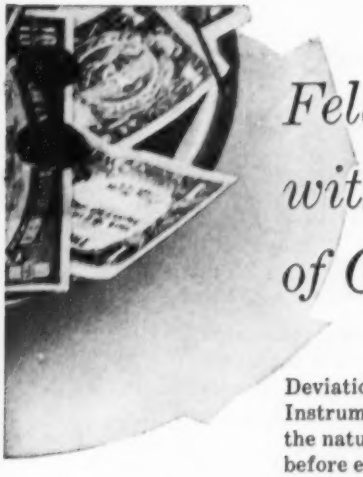
Fellows
Red Liners

Fellows
Lead Measuring
Instruments

Fellows
Involute Measuring
Instruments

THE
PRECISION
LINE

WEIGHT IN PROFITS



Fellows Gear Inspection Instruments with Chart Recorded Proof of Gear Accuracy

Deviations of the "red line" on a chart from a Fellows Gear Inspection Instrument, not only warn of costly gear errors—but indicate the nature of that error. Proper adjustments can thus be made immediately before expensive rejects accumulate in long production runs.

The use of Fellows Gear Inspection Instruments to continually "spot check" gears keeps waste of time, labor and materials to a minimum... provides undeniable chart recorded proof of gear accuracy... guarantees superior performance for the life of your product.

- **For composite check,** FELLOWS RED LINERS record gear errors in combination on a chart as the precision master rotates in intimate contact with the gear being checked. 3 models to 18″ p.d.
- **For checking lead,** FELLOWS LEAD MEASURING INSTRUMENTS check various leads—also crown and taper. No involved calculations required. Errors charted by an electronic recorder at 500 to 1 magnification. 12″, 24″ p.d. models.
- **For checking involute profiles,** FELLOWS INVOLUTE MEASURING INSTRUMENTS check accuracy of involute profiles—also location of involute modifications. Electronically provide charts at 500 to 1 magnification. 12″, 24″ p.d. models.

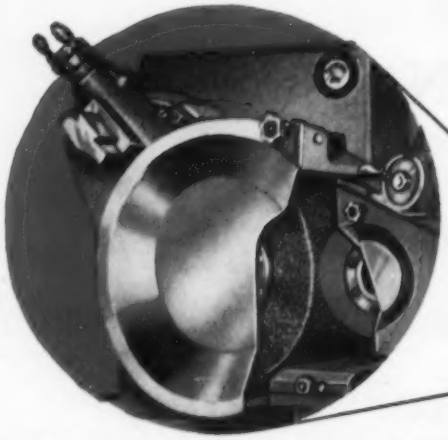
There's a Representative in any Fellows office who will be glad to show you how to operate Fellows Inspection Equipment... and just how, in your operation—Fellows Gear Inspection Instruments can be "worth their weight in profit".

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2
5835 West North Avenue, Chicago 39
150 West Pleasant Ave., Maywood, N. J.
6214 West Manchester Avenue, Los Angeles 45

Fellows *Gear Production Equipment*

VAN NORMAN

New

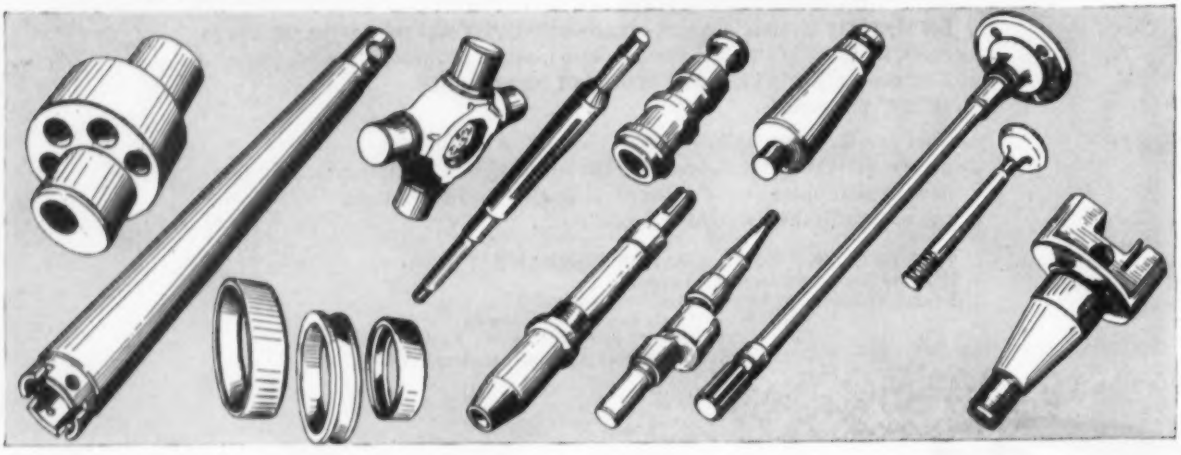


The new Van Norman No. 2C Grinder is *engineered* for fast, accurate, economical grinding of parts. Incorporated in the many outstanding features is the *15 HP* main drive motor which provides ample power for every grinding job. Couple this with the totally enclosed rugged grinding wheel spindle and you get close-tolerance smooth finishes plus chatterless, trouble-free operation.

Compare These Outstanding Features

- Hard chrome plating of regulating wheel slide after hand scraping, preserves original factory built-in accuracy.
- Grinding wheel and regulating wheel spindles are of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life, assuring chatterless trouble-free operation.
- Spindles require no warm-up period, eliminating "creep" which has always been a problem in grinding operations.
- Infinitely variable regulating wheel drive.
- Totally enclosed fan cooled, dynamically balanced 15 HP main drive.
- Independent hydraulic wheel truing devices for each wheel.
- Fine hand wheel adjustment on diameter of work piece.

Phone, wire or write for full details on the new Van Norman No. 2C Centerless Grinder.



Grind Parts Like These Accurately, More Economically

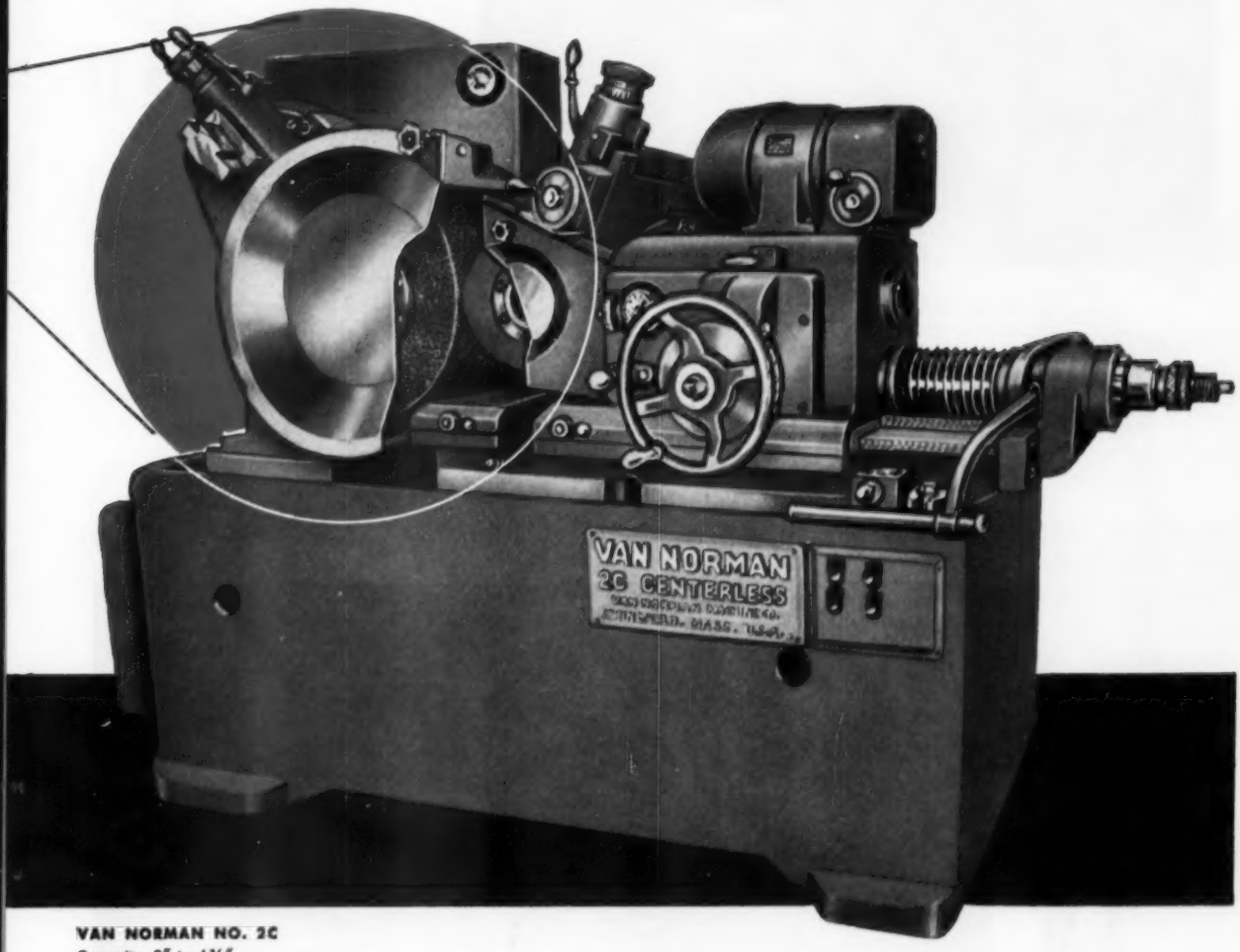
VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

No. 2C Centerless Grinder

...Features 15 HP Main Drive

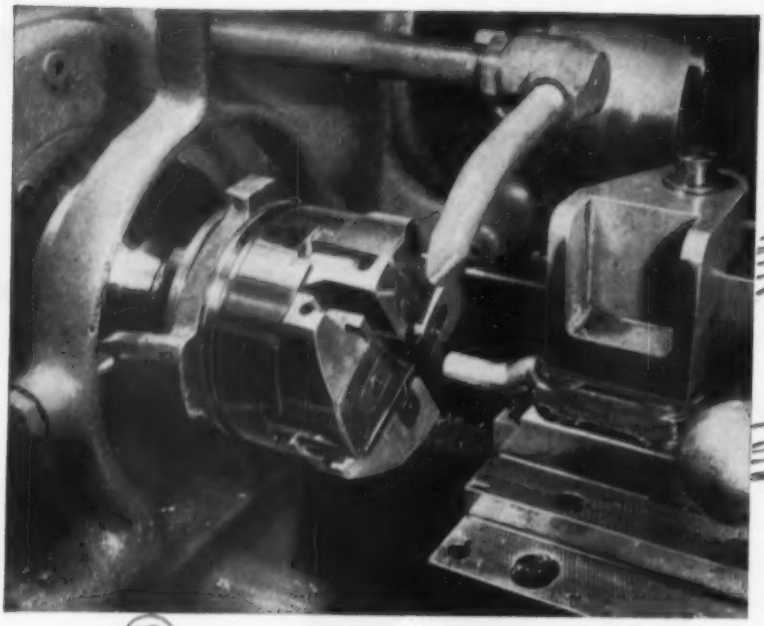
Assuring Precision, Close-Tolerance Grinding

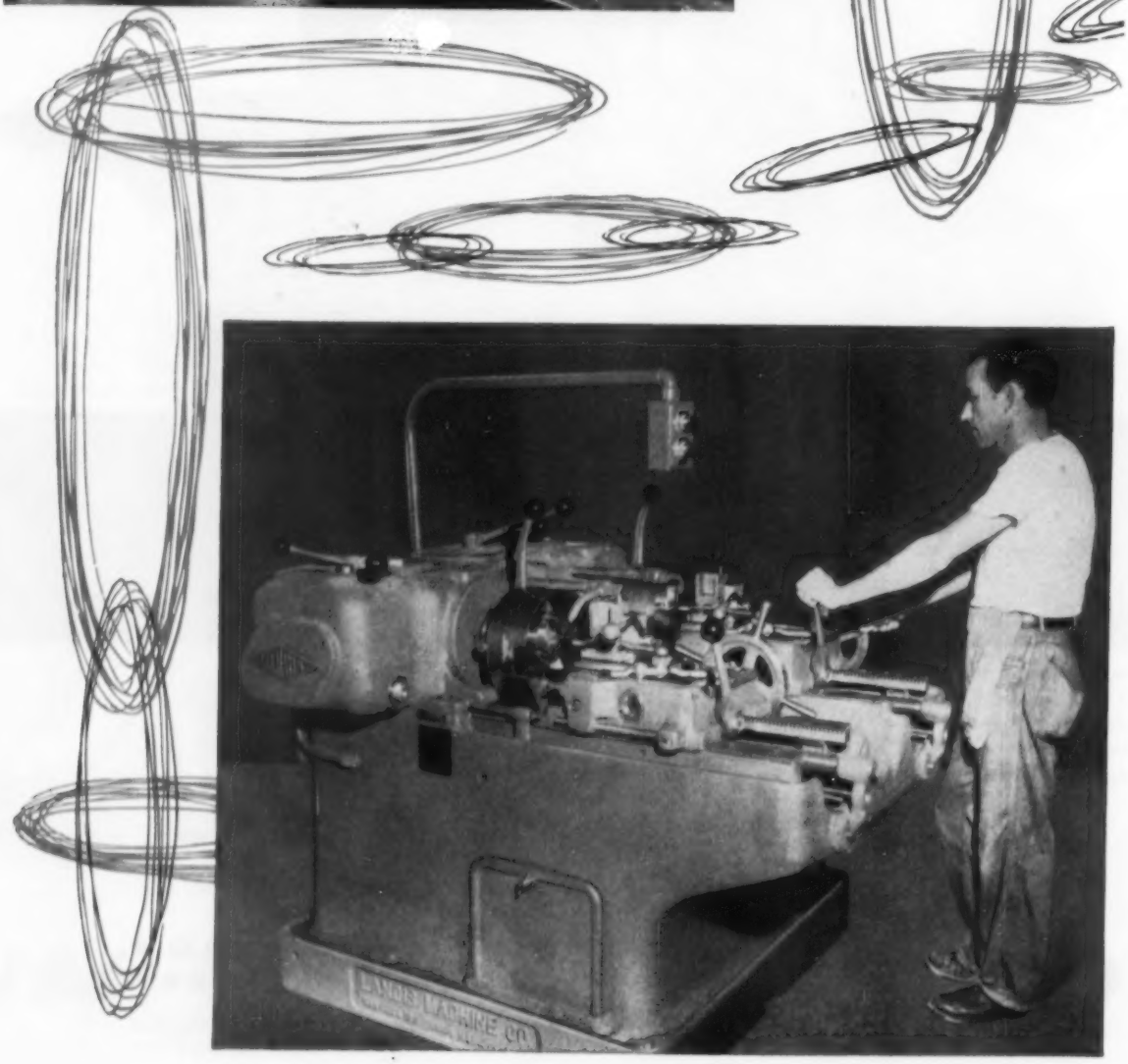


VAN NORMAN NO. 2C
Capacity: 0" to 4¼"
Grinding wheels available: 24" x 4" x 12"; 24 x 6" x 12"; 24" x 8" 12"
Regulating wheels available: 12" x 4" x 5"; 12" x 6" x 5"; 12" x 8" x 5"
Automatic cycling and gauging available.

Don't wait . . . for extra profits install a Van Norman Machine now!
They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . See your dealer or write Van Norman Company. Conditional Sales Contracts not available to Export.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**




LAMBS MACHINE CO.

FASTER TURNING

Using 4 Cutting Tools

SIMULTANEOUSLY

Automotive parts production at Thompson Products in Detroit has been substantially increased by turning, facing, and chamfering on Landis Threading Machines. This LANDIS **Hollow Milling** technique makes large out-put increases possible by applying a number of simultaneously-functioning cutters, thus multiplying the feed rate of a single tool.

The illustrations show one of these parts, steering links, being turned and faced on a LANDMACO Double-Spindle Leadscrew Threading Machine. SAE 1040 steel forgings are turned (1/32" stock removal) 1⅛" in length and faced by four special turning cutters in ⅞" V LANCO Hardened and Ground Heads. Production regularly averages 200 pieces per hour, with the ⅝" turned diameter held within ±.004". Four hours production is obtained between cutter grinds.

This LANDIS technique offers important advantages over other methods of turning, forming, and facing. The use of four or six simultaneously-functioning cutters, in addition to increasing production, reduces tool cost and workpiece spoilage to the minimum. The diametrically-opposing cutters evenly distribute cutting strains and maintain proper work alignment. LANDIS Cutters, available in a wide variety of styles, are economical for they are usable for most of their length with only a simple regrinding of the rake angle.

Additional information will be sent on request—please include specifications when writing.

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS Machine CO. WAYNESBORO PENNSYLVANIA

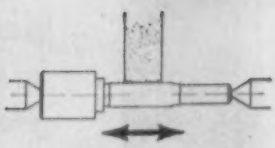
911-G

Landis automatic cycle cuts

1 Operator moves infeed lever. Wheel head moves rapidly to grinding position by hydraulic power. Work rotation and coolant flow begin.

Landis 4" x 18" Type H Plain Cylindrical Grinder with extra cost semi-automatic cycle. Write for catalog A-54.

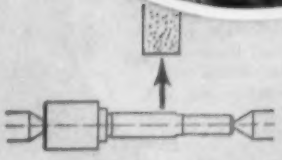
unit grinding costs up to 50%



2 Hydraulic slow grinding feed and hydraulic traverse operate automatically. Operator changes dogs on workpieces during grinding period.

3 Wheel automatically moves back after work has been ground to pre-set size. Coolant stops and infeed lever re-sets.

4 Operator moves footstock lever to unload and load workpieces. Cycle ready to repeat.



LANDIS
precision grinders

LANDIS TOOL COMPANY
WAYNESBORO, PENNSYLVANIA

UNSURPASSED *versatility...*

Giddings & Lewis 30-Series Horizontal Boring, Drilling and Milling machines assure extra rigidity, maximum capacity, precision performance for a broad range of applications

UNUSUAL WIDE RANGE of precision machining operations —that's what you get when Giddings & Lewis 30-Series horizontal machines start to work in your shop. These highly versatile (table type) horizontals offer you more combinations of profitable machining operations than any other machine in this size ever built!

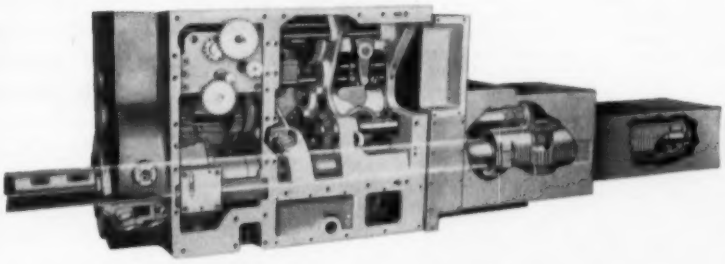
Available in two models — 350-T with 5" dia. spindle (25 hp) and the 340-T with 4" dia. spindle (20 hp)—they feature rugged design and capacity-boosting optional attachments. Included are: angular milling attachments, continuous feed facing head, automatic electric-operating positioning device for headstock and table travel, *Dupli-TRACER* for 2- or 3-dimensional contour tracing and 360° profiling, G&L's exclusive "Lubri-Cool" system for headstock and milling feed unit, and many other time-saving, profit-making arrangements.

For more information, be sure to contact your nearest Giddings & Lewis representative today!

Literature Available:

For complete specifications on G&L 30-Series (table-type) Horizontal Boring, Drilling and Milling machines, ask for Bulletin No. 30-T.

UNLIMITED *productivity*

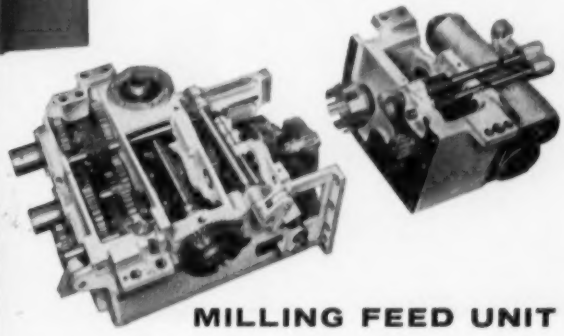


HEAVY-DUTY HEADSTOCK

Rapid-Change Feeds and Speeds — G&L headstock offers the ultimate in precision workmanship. Superb design assures smooth, vibrationless operation and is the key to high productive capacity. Positive gear drive permits high torque at lower speeds and full horsepower at higher speeds. You get *36 independent feeds* to the spindle . . . a minimum of *45 workable spindle speeds.*

Operator can use either the conveniently located lever or push button control for sensitive inching and tapping operations.

Rotary Selectors — Dial openings show spindle speed or feed engaged. Operator merely watches window until desired setting is obtained. *There's no need for matching of levers with charts.*



MILLING FEED UNIT

Greater Milling Capacity — G&L 30-Series Horizontals are particularly adaptable to a broad range of milling operations such as milling angular outlines at high rates of speed. A nine-speed box and a set of back-gears provide eighteen milling feeds for the headstock, table and saddle; selective clutches for feed and rapid traverse; planetary reduction for two distinct ranges for the saddle feed.

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

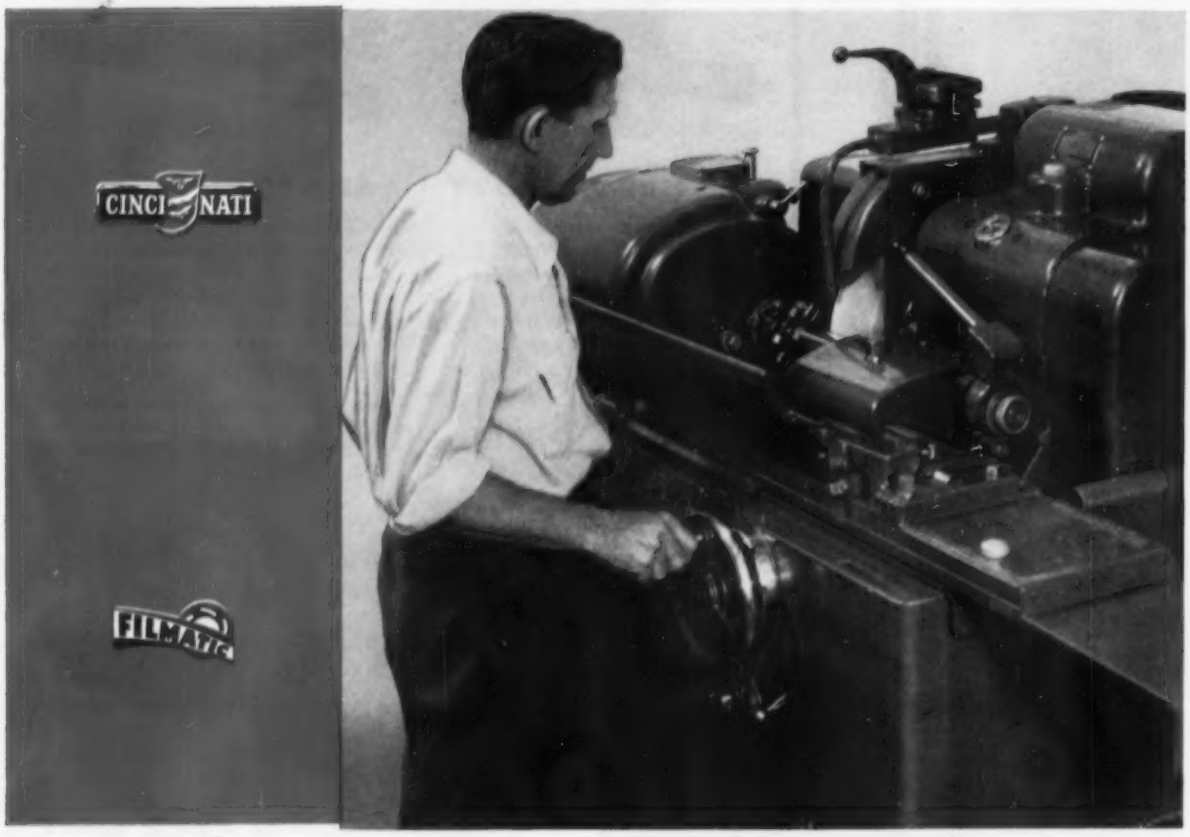
Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Open-side Planers; Planer-Type Milling Machines; Vertical Boring Machines; Spar and Skin Milling Machines, and VARIAX Milling Machines.

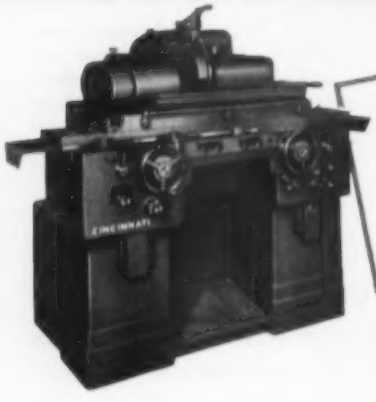
G-67

Here's the Point . .

. . . your standard and special tooling high precision work, from the point on a textile machine part to small armature shafts, get the most economical grind on CINCINNATI® FILMATIC 4" Plain Hydraulic Grinders. May we tell you more? Catalog No. G-551-4 contains complete data; write for a copy.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



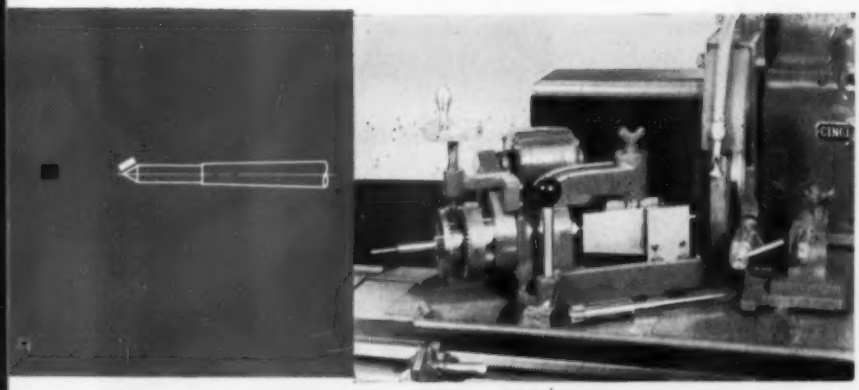


CINCINNATI FILMATIC 4" PLAIN HYDRAULIC GRINDING MACHINE
Catalog No. G-551-4
Brief Specs. in Sweets

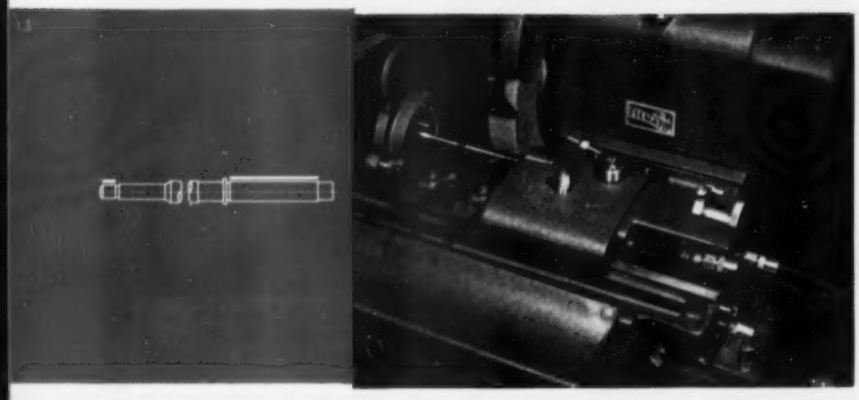
Master roller gages are ground to accuracies of 10 millionths in roundness and size on the CINCINNATI FILMATIC 4" Plain illustrated here. Surface finish within 2 micro-inches. Of course this machine is equipped with a number of extra features to enable it to produce ultra-precision work of this type. Compared to the previous machine and method, tolerances have been cut in half and production is about seven times greater.

CINCINNATI

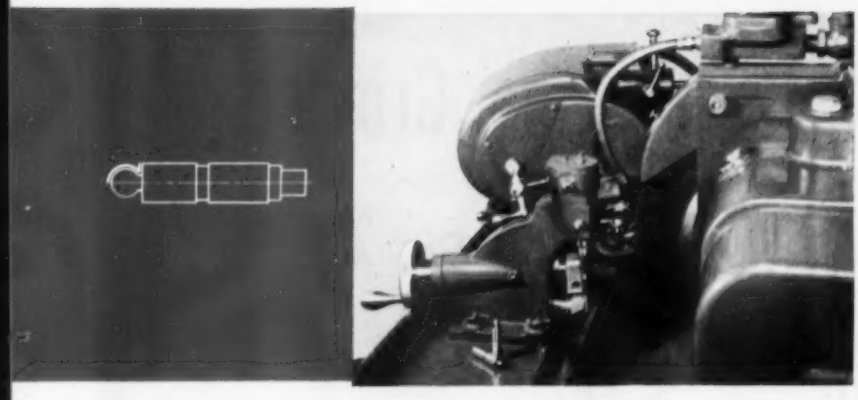
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE



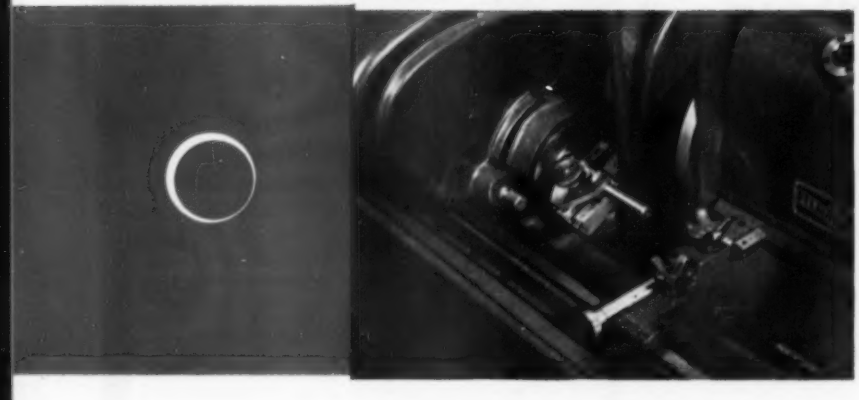
Center angle and point radius are ground concentric with bearing diameters on textile machine parts. This Cincinnati engineered equipment illustrates how simply an unusual production job can be tooled up on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Conventional swivel table, headstock and footstock have been omitted and replaced by a special fixture.



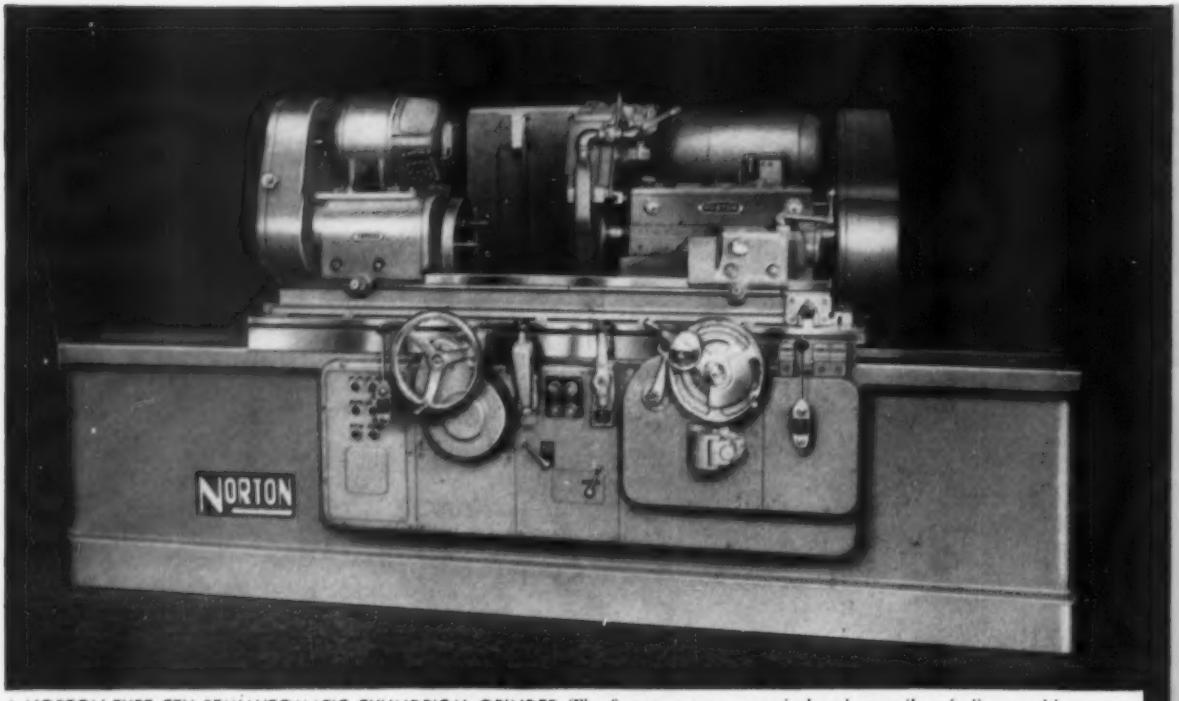
Two diameters are precision ground on armature shafts in two setups, at the rate of 200 per hour per diameter. To reduce operator fatigue while maintaining a high rate of production, the CINCINNATI FILMATIC 4" Plain Hydraulic Grinder for this job is equipped with automatic infeed, hydraulic footstock and work cradles.



Ball end and shoulder are ground in one chucking on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Unique tooling for this job includes combination radius and angular truing attachment, and table with an angular bearing section for live spindle headstock featuring a lever operated draw-in collet attachment.



.048" eccentric diameter ground from the solid. The CINCINNATI FILMATIC 4" Plain Hydraulic Grinder at the left easily handles this heavy stock removal job. Equipment is practically standard with the exception of the work holding fixture and a special table type truing attachment.



A NORTON TYPE CTU SEMIAUTOMATIC CYLINDRICAL GRINDER. The fastest, most economical and versatile grinding machine of its type. One-lever control of the automatic grinding cycle reduces the operator's duties to loading and unloading. Both the 6" and 10" Type CTU's are available as semiautomatics or as plain machines.

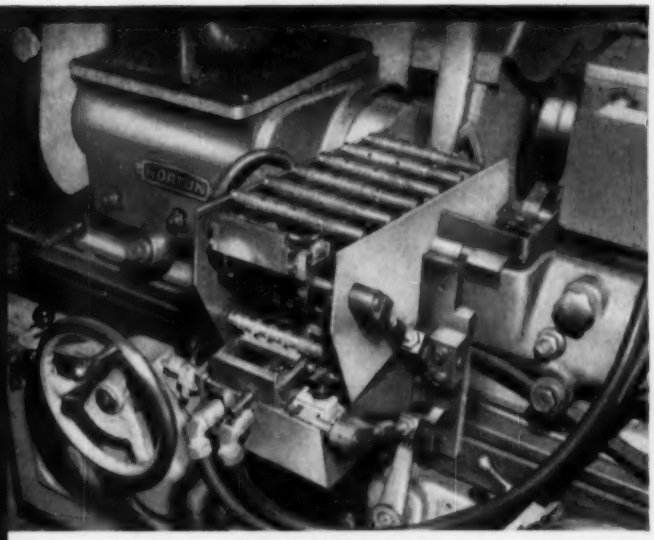
Norton Type CTU Cylindrical Grinders are packed with features for...

Production line and job shop users report that Norton 6" and 10" Type CTU cylindrical grinders have doubled and tripled production, replaced several machines and eliminated costly extra operations.

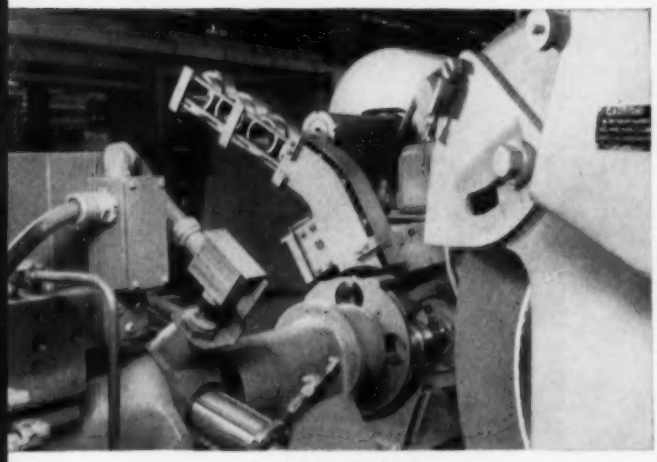
That's because of the many time-and-work-saving "Touch of Gold" features — standard and auxiliary — available with these grinders.

Some of the expertly automated auxiliary features are described here. Check them carefully — and figure their value to your own cylindrical grinding operations. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. For further facts, see your Norton Representative, or write to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

THE SWIVALIGN* ELIMINATES CUT-AND-TRY. Another Norton "Touch of Gold" development for faster, better, lower cost grinding. The SWIVALIGN Dual Electric Indicator, available for Norton cylindrical and universal grinders, enables operators to adjust the angular positions of swivel tables quickly and accurately, eliminating the usual cut-and-try guesswork. Featuring positive response and easy operation, this accurate instrument saves grinding time and money.

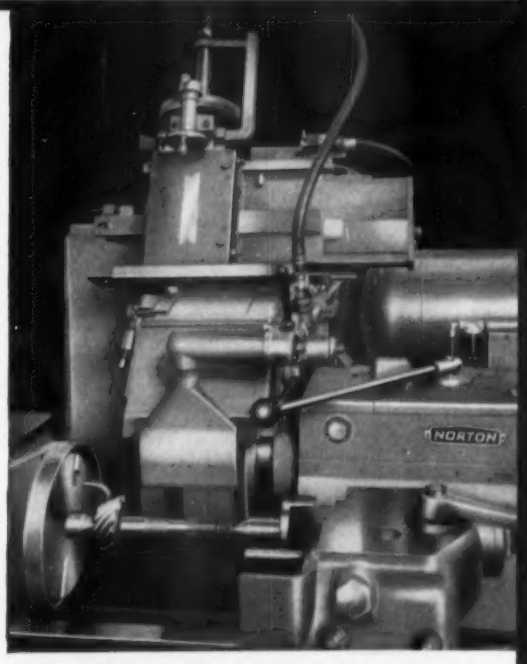


RAIL TYPE



TURRET TYPE

YOUR CHOICE OF AUTOMATIC LOADING DEVICES. Two types of Norton automatic loading devices are obtainable with 6" and 10" Type CTU semiautomatic grinders. The rail type loader is designed to handle a variety of small shafts. The turret type loader handles workpieces which must be chucked. Thanks to their steadily paced, automatic operation these Norton-developed loading mechanisms can be adapted to full automation. Or, they make it possible for one operator to tend a battery of machines, speeding production and cutting unit costs day after day.



WHEEL HEAD MOUNTED AUTOMATIC TRUING OFFERS BIG ADVANTAGES. A Norton automatic truing device, as shown here on a Type CTU grinder, quickly repays its original cost. It speeds up production, increases wheel life and increases diamond life. Also, it decreases the skill and effort required with hand truing. Operation is extremely simple. Once the original settings are made, all you do is push a button. Then the diamond automatically makes its round trip across the wheel face, at pre-determined speed and feed. Easy adjustments assure correct settings for each job . . . Another step forward in automatic grinding!

NORTON

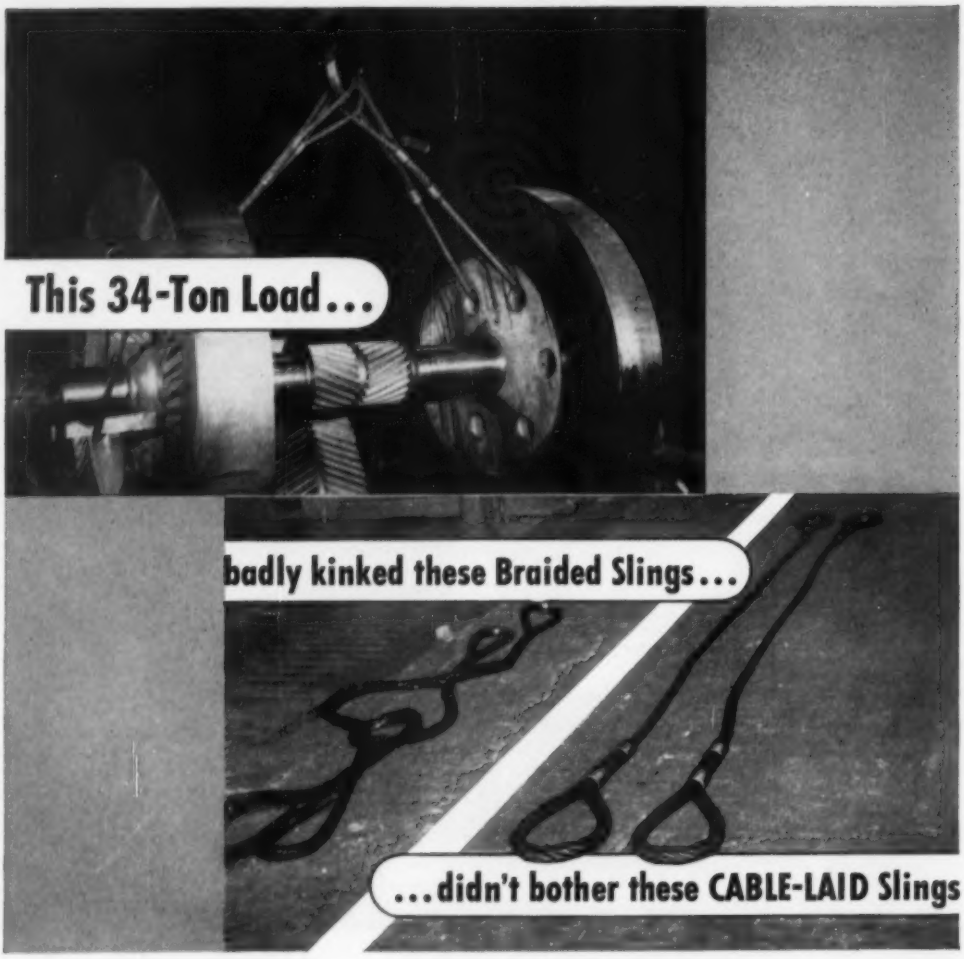
GRINDERS and LAPPERS

Making better products . . . to make your products better

District Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit

*SWIVALIGN — Norton trade name for Dual Electric Indicator for accurate measurements of swivel table adjustment.

ACCO Registered* Wire Rope Slings



Here's Why:

• Because these ACCO *Registered** CABLE-LAID slings combine the flexibility of manila rope with the strength of steel.

The secret of CABLE-LAID lies in the combination of a special wire-rope construction with ACCO's patented DUALOC ending. This combination gives

- **Freedom from Crankiness**
- **Extreme Flexibility**
- **Resistance to Kinking**

These qualities make CABLE-LAID slings tops in ease of handling...help them resist abuse ...give you longer sling life which reduces lifting costs.

And these slings are ACCO *Registered*—each part has been individually tested and the completed sling proof-tested at twice the load-carrying capacity for which it is rated.

See your ACCO *Registered* distributor, or write our Wilkes-Barre, Pennsylvania, office today.

FREE FOLDER

• *Write Wilkes-Barre office for your copy of new Folder* **DH-532**, *which gives strengths and weights (for six different lifts) on a full size range of ACCO Registered CABLE-LAID slings.*

*Trade Mark Registered

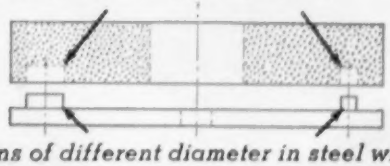
ACCO

American Chain & Cable Company, Inc., Wire Rope Sling Department

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Improved Gardner TRU-LOK® assures precision disc mounting for truer running

Molded, rigid plastic inserts in dowel holes now provide greater accuracy in mounting.



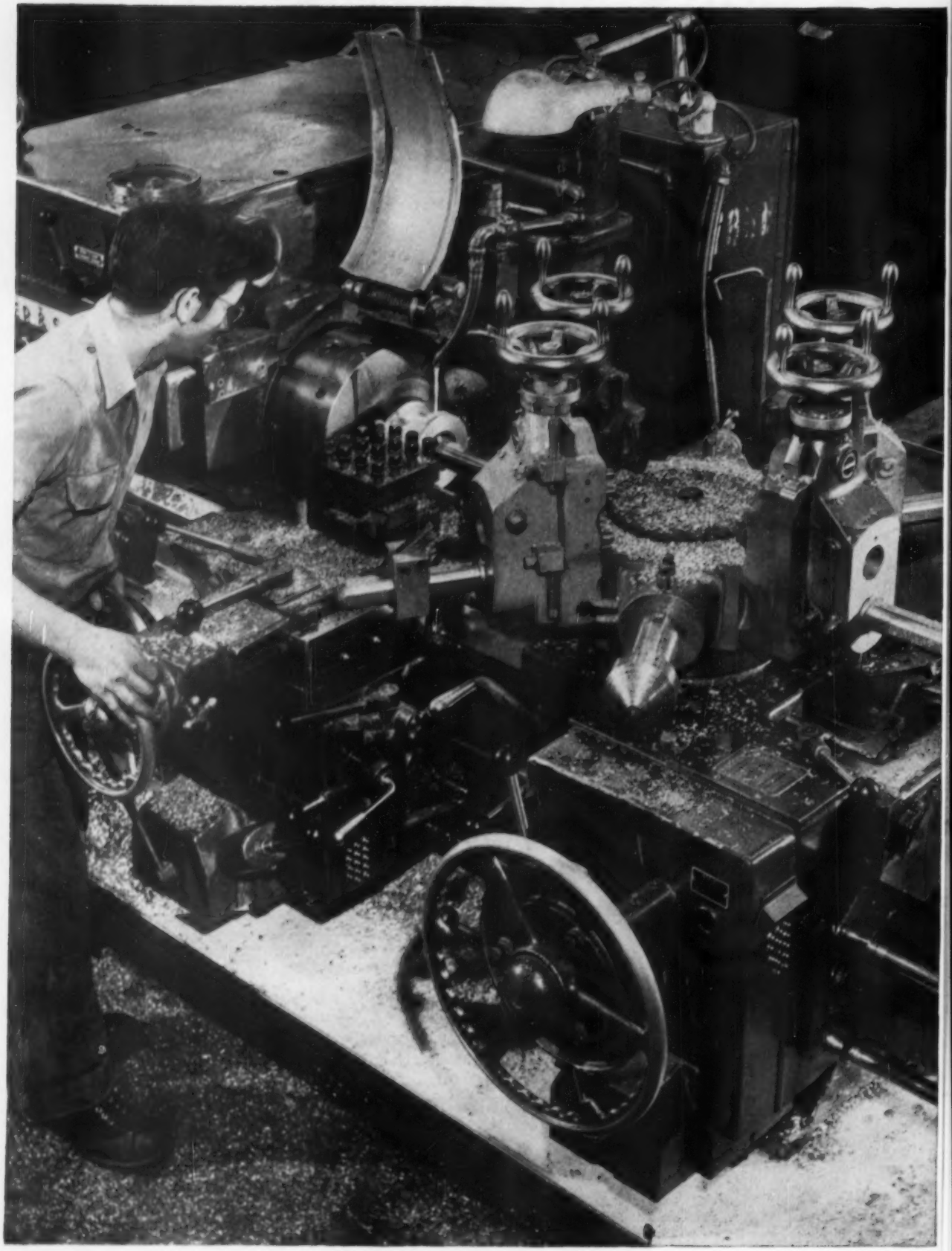
Dowel pins of different diameter in steel wheel must match holes in disc.

Gardner TRU-LOK eliminates run-out and vibration caused by off-center mounting. Disc can be bolted to steel wheel only in position established at time of disc manufacture.

GARDNER

abrasive discs

BELOIT, WISCONSIN



WARNER & SWASEY 1-A

efficiently handles small lot brass work at Beloit Iron Works

GIANT, city-block-long paper making machines made by Beloit Iron Works, Beloit, Wisconsin, require hundreds of different precision machined parts—in extremely small lots. For much of their turning work, Beloit depends on a large battery of Warner & Swasey turret lathes, machines ideally suited to the different classes of small lot work they have.

The machine shown—a new Warner & Swasey 1-A Universal Extra Heavy Duty Turret Lathe—was selected to handle an especially critical turning problem. This involved the production of brass castings in lots less than 15 pieces, where the qualities of high speed and great power are required, in addition to extreme machine maneuverability. The new Warner & Swasey 1-A is designed to meet just such demands!

Its zoned operating controls put all machine controls within easy reach. Operators can quickly and easily set the cross slide, the hex turret unit, or position tools. The 1-A's all-clutch headstock permits instantaneous speed changing for fast, effortless headstock handling. And for threading or forming cuts, a 4 to 1 speed reduction can be obtained instantly without preselection merely by flipping the speed change lever in the opposite direction. The power chuck wrench further speeds handling time, cuts operator fatigue.

This machine is also equipped with longitudinal dials for setting lengths of cut, eliminating the setting of stops—another reduction of handling time on this small lot work.

A 30 hp, two-speed motor furnishes all the power necessary for high speed brass turning plus a range of 32 unduplicated cutting speeds from which the most efficient speed can be quickly obtained for every cut. Its rigidity and Vee-Way construction assure holding required accuracies of .001.

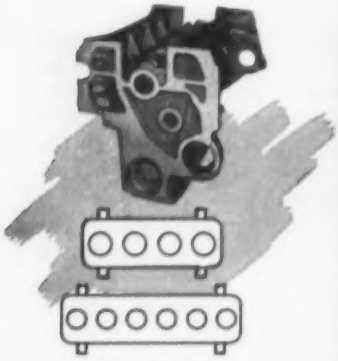
This 1-A, like the other Warner & Swaseys, has proved its efficiency for Beloit Iron Works because it is matched with the type and range of work for which it is designed. Our Field Representative will be glad to work with you to select the machine tools that will similarly best suit your needs.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

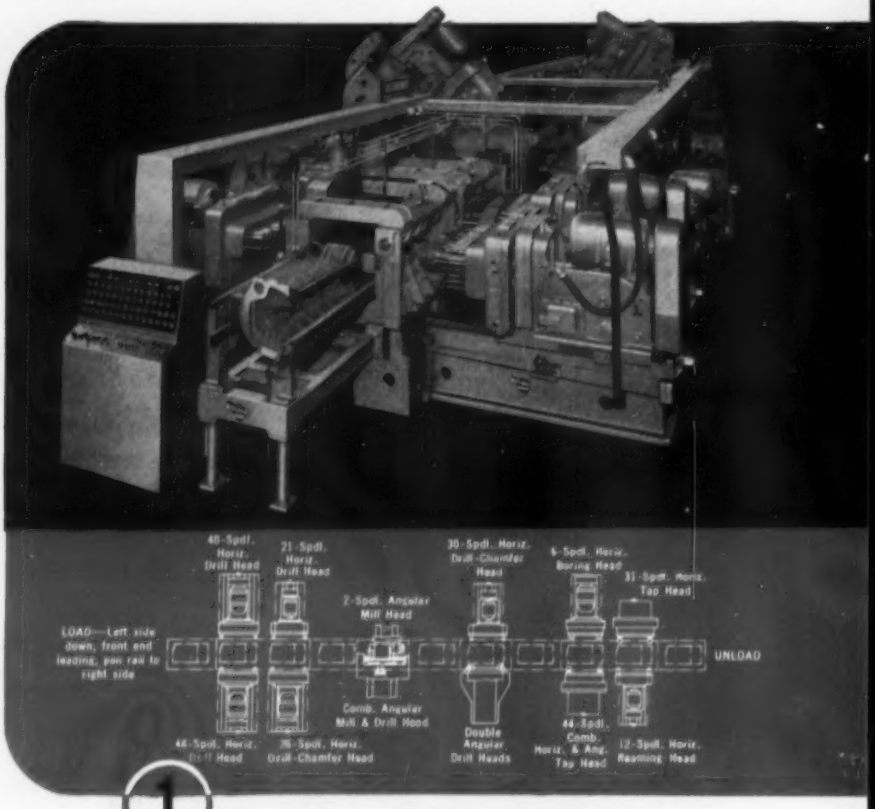
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

DUAL-PURPOSE SPECIALS

● Here's another outstanding example of how W. F. & John Barnes Coordinated Creative Engineering and Manufacturing Service has helped cut production costs . . . this time for a well-known farm equipment manufacturer. These three special machines have been ingeniously designed to machine TWO SIZES of tractor engine blocks . . . double-duty performance that not only means a lower original investment, but also simplifies tooling, reduces floor space requirements, and increases over-all production efficiency. Careful planning of tooling and machine components holds change-over time to a minimum . . . in fact,



Both 4 and 6-cylinder blocks are processed on the same Barnes' Special Machines.


40-Spdl. Horiz. Drill Head
21-Spdl. Horiz. Drill Head
2-Spdl. Angular Mill Head
30-Spdl. Horiz. Drill-Chamfer Head
6-Spdl. Horiz. Boring Head
31-Spdl. Horiz. Tap Head
LOAD—Left side down, front end leading, pan rail to right side
UNLOAD
Comb. Angular Mill & Drill Head
48-Spdl. Horiz. Drill Head
76-Spdl. Horiz. Drill-Chamfer Head
Double Angular Drill Heads
44-Spdl. Comb. Horiz. & Ang. Tap Head
12-Spdl. Horiz. Reaming Head

1 Barnes 11-Station Progress-Thru Machine completes drilling, tapping, and milling operations on the 4 and 6-Cylinder Diesel Engine Blocks. Bushing plates, guide rails, head stops, transfer pusher fingers, and other machine components are quickly adjustable to handle both block sizes.

SAVE TIME WITH BARNES' COORDINATED 6-POINT BUILDING SERVICE

"Shopping around" is often a costly, time-consuming task, and all too often the results are disappointing . . . that's why Barnes offer a complete machine tool building service from *one convenient source* . . . it saves time and cuts costs because all the work is coordinated in one plant. Barnes' service includes:

1. **SPECIALIZED MANUFACTURING FACILITIES**—75-year background, large well equipped plant efficiently tooled to build high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
4. **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operations at high production speeds.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT**—designed and built to reduce work handling, effect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING**—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

W. F. & JOHN BARNES

Builders of Better Machines Since 1872

Multiple Spindle Drilling • Boring

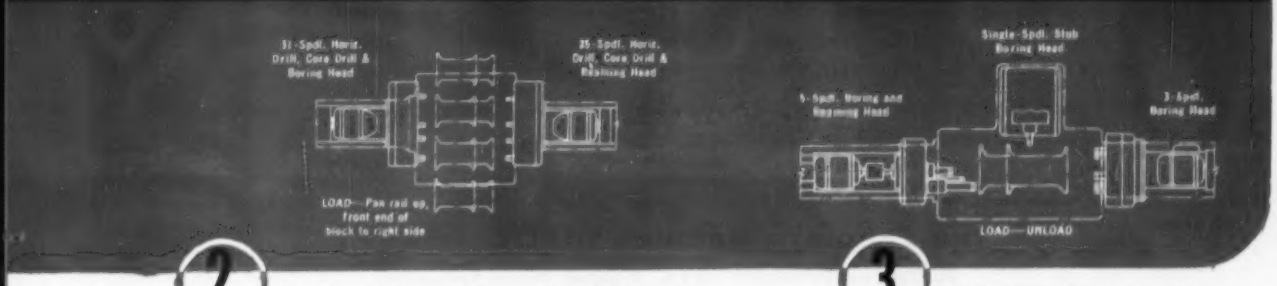
• MACHINE BOTH 4 AND 6 CYLINDER ENGINE BLOCKS

much of the tooling is common to both block sizes and does not require changing. Bushing plates, guide rails, head stops, and transfer pusher fingers quickly and easily adjust to accommodate for variations in the two block designs. Where tooling changes are required, easy accessibility and quick conversion and set-up features speed the change-over.

OVER 75 YEARS OF MACHINE TOOL BUILDING EXPERIENCE

This unusual application is only one of many produced by Barnes . . . the result of over 75 years of accumulated knowledge in the highly specialized machine tool field. Creative skills, plus complete and extensive building facilities, assure you of machines possessing maximum capability for lowering production costs and improving product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS . . . YOUR PROBLEMS WILL RECEIVE EXPERT AND INDIVIDUAL ATTENTION

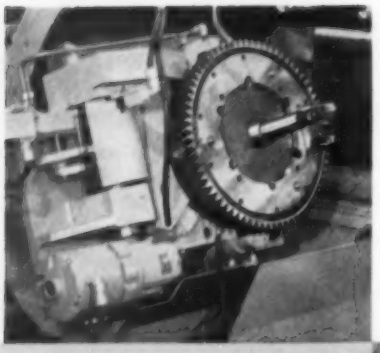

31-Spdl. Horiz. Drill, Core Drill & Boring Head
25-Spdl. Horiz. Drill, Core Drill & Reaming Head
LOAD—Pan rail up, front end of block to right side
Single-Spdl. Stub Boring Head
5-Spdl. Boring and Reaming Head
3-Spdl. Boring Head
LOAD—UNLOAD

2 **Barnes Special 4-Station Progress-Thru Machine completes drilling, boring, and reaming on the blocks. Here again, adjustable features are built in to compensate for the two block sizes. Electrical interlocks on these machines prevent accidental tool damage during change-over. Idle stations are included for future tapping operations.**

3 **Special 3-Way Cam and Crank Boring Machine precision bores both block sizes. Adjustment features are similar to the preceeding machines. All units are electrically controlled for automatic cycle sequence with push-button operation.**

Write Today **FOR YOUR COPY**
of "Coordinated Machine Engineering"—a 32-page booklet of automation equipment ideas.

W. F. & JOHN BARNES COMPANY
401 SOUTH WATER STREET, ROCKFORD, ILLINOIS
Tapping Machines • Automatic Progress-Thru and Transfer Type Machines



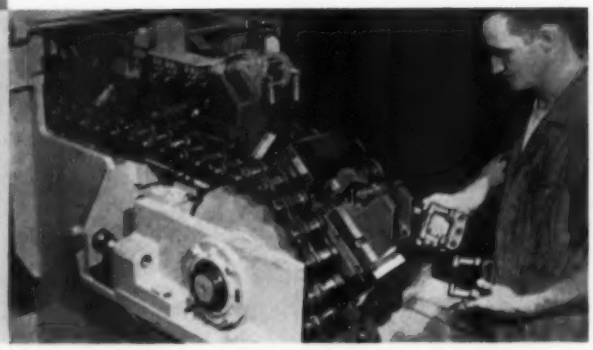
1.

LAPOINTE goes with you

LAPOINTE

BROADCHING

You've been hearing a lot about Lapointe taking *all the responsibility* for the complete broaching program. Here are some Lapointe-built Broaching Fixtures that can help reduce your production costs.



2.

Production costs are far too high in many plants. Certain machining processes could advantageously be converted to Lapointe-Broaching. When that decision is made, it naturally follows that the greatest savings will be accomplished by "going Lapointe 100% . . . including the fixtures and broaches.

Broaching Fixtures can make or break a job! Our engineers, due to their accumulated years of intensive experience in broaching (far longer than that of anybody else) have developed a sort of "sixth sense" about fixtures that is all in your favor. They know how to design a fixture that is at once efficient, fool-proof, easy on the operator . . . and safe.

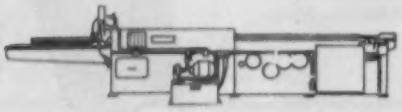
Why not let a Lapointe Field Engineer talk with you about *cost reduction*, using Lapointe-built Broaching Fixtures?

THE LAPOINTE MACHINE TOOL COMPANY

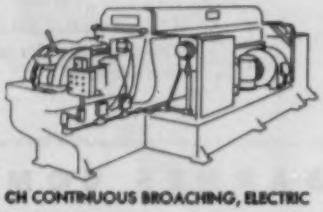
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

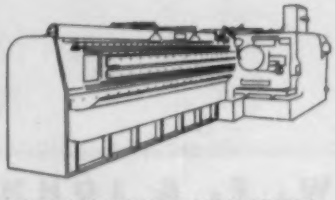
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



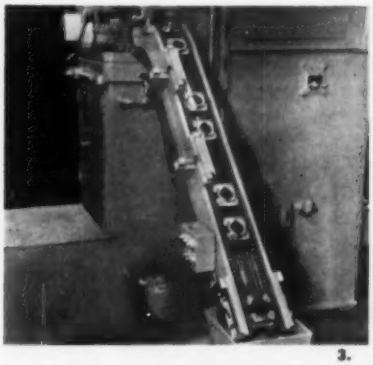
CH CONTINUOUS BROACHING, ELECTRIC



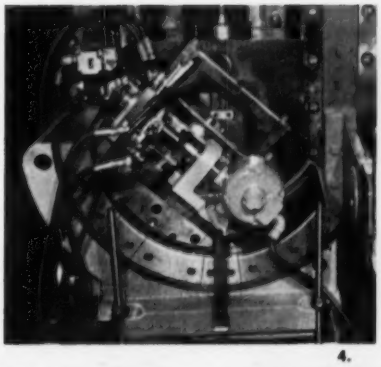
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

all the way . . .

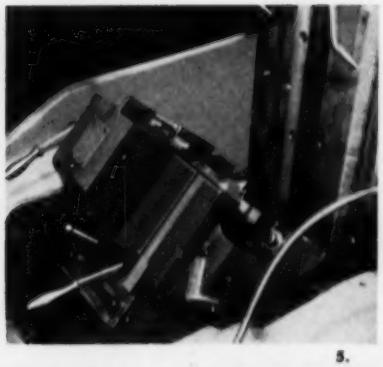
designs and builds the FIXTURES too!



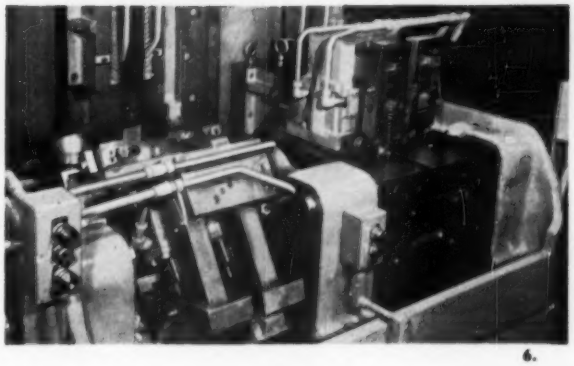
3.



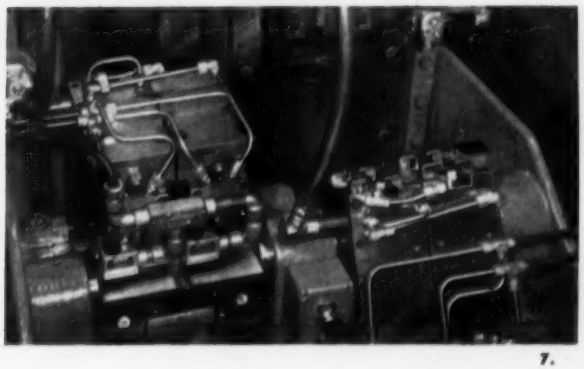
4.



5.

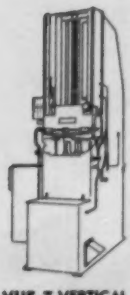


6.

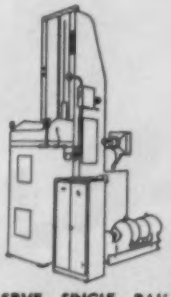


7.

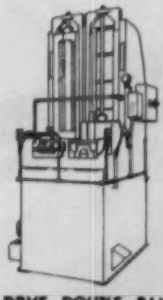
1. This extremely accurate automatically indexed fixture is used on the Lapointe Single Ram Horizontal Broaching Machine, with electro-mechanical drive. 2. As many as 24 fixtures can be used on the Lapointe Continuous-Broaching Machine. 3. Lapointe-built Loading Chute is a step toward full automation. 4. This universal fixture can be set from 0° to 45° rotatively, and 0° to 30° conically, enabling parts to be processed at a compound angle. 5. Special mid-stroke indexing of part in the Tip-Down fixture permits 2 cuts to be made at right angles to each other without removing the part from its nest. 6. Lapointe patented Tip-Down Fixtures permit maximum ease in loading. No bending, no reaching! The fixtures are automatic-clamping, hydraulically operated. As shown, broaching an automotive front suspension arm. 7. Tip-Down Fixtures with integral coolant system piped into the fixture.



VUE-7 VERTICAL PULL -UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC

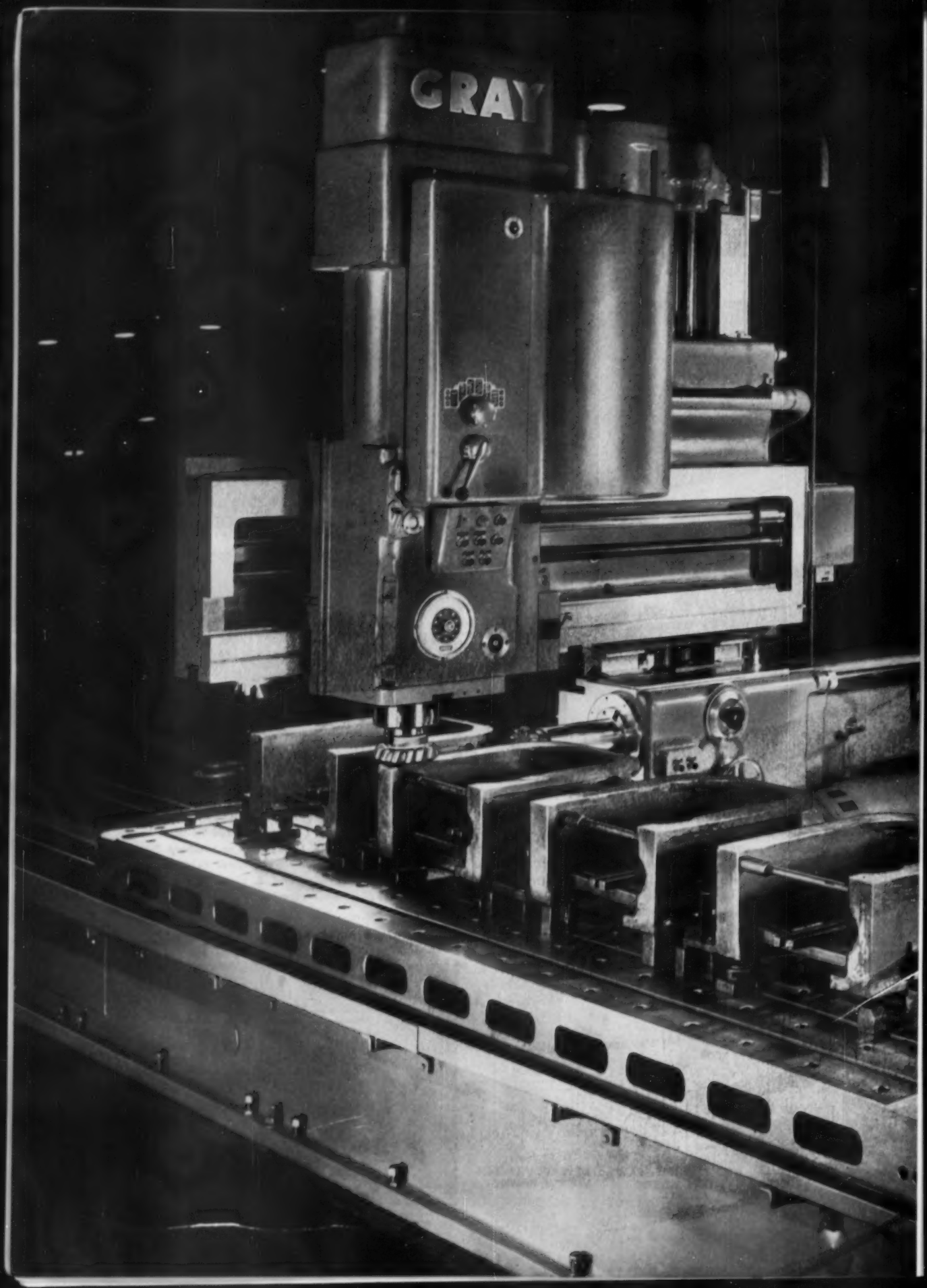


DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING


GRAY

If you're tired of seeing small jobs on your large expensive millers . . .

If you're tired of extra set-ups because your miller has only a single head . . .

If you're tired of whittling away at rugged jobs with low power heads . . .

If you're tired of complicated controls that make your operator a mountain goat . . .

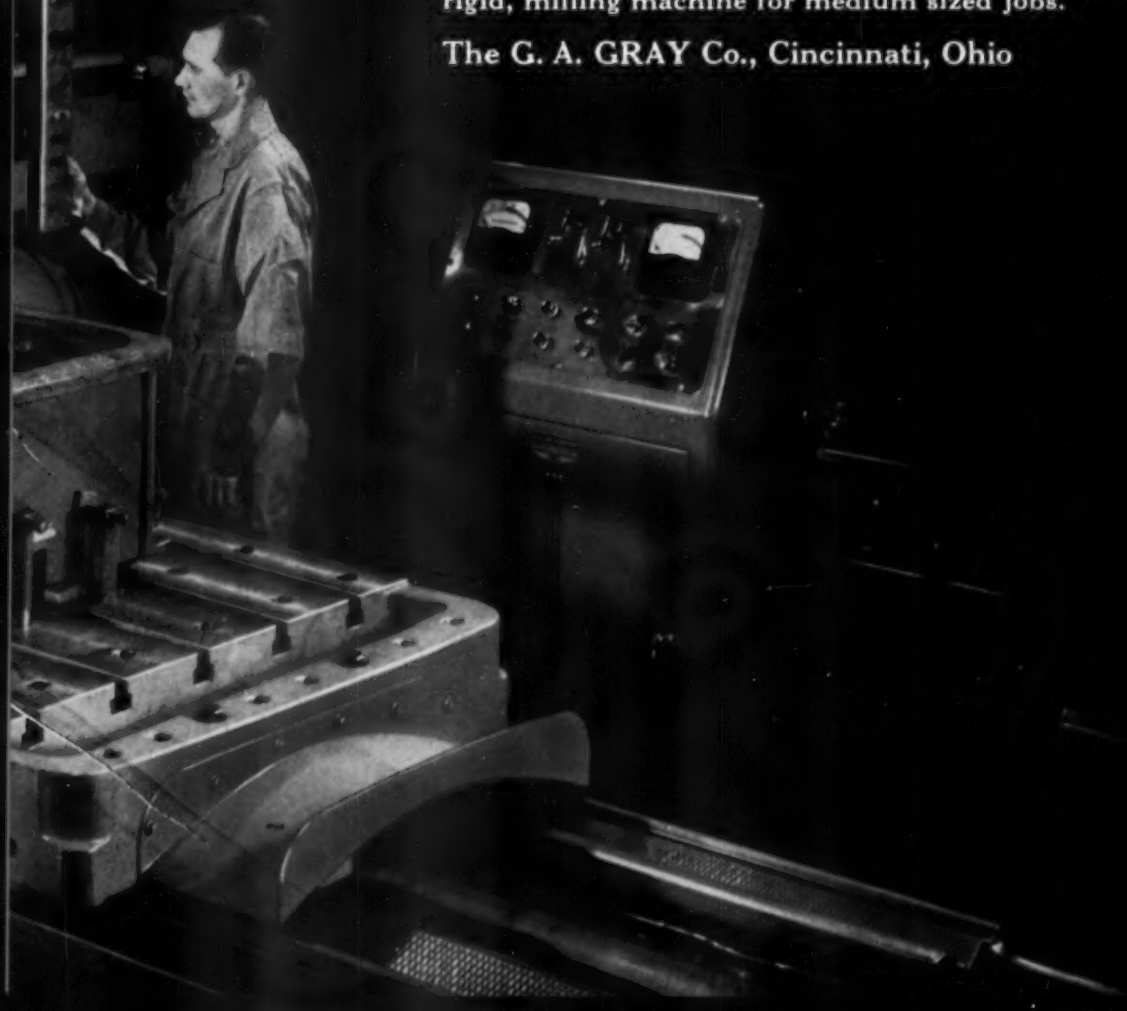
this new

GRAY HANDYMILL

is for you

Built in a wide range of high horsepower sizes, with great variety in head combinations, simplified pendant control, it fills a long standing need for a powerful, rigid, milling machine for medium sized jobs.

The G. A. GRAY Co., Cincinnati, Ohio



Different In Every Way! *New* 44 ALUNDUM abrasive (at right) *looks different* from ordinary aluminum oxide abrasive, with a finer grained surface that denotes greater density and toughness. That's because it's *made differently*, by a special Norton-developed electric furnace process. And that's why it *performs differently*, with new time-and-money-saving "Touch of Gold" advantages.

INTRODUCING . . . the NEW

44 ALUNDUM* abrasive

. . . most sensational non-premium abrasive ever developed . . . with new "TOUCH of GOLD" benefits for better, lower cost grinding

(Advertisement)

44 ALUNDUM abrasive gives excellent results on many grinding applications

The big news about the new 44 ALUNDUM abrasive is this:

For a non-premium priced aluminum oxide abrasive, its performance, job range and service life are truly sensational.

It's a real work-horse abrasive — with extra ruggedness and durability that can take on a lot of tough grinding jobs and come back for plenty more.

This has been proved in more than 1100 tests. Plants all over the country have reported that 44 ALUNDUM wheels have these advantages over ordinary aluminum oxide wheels:

LONGER LIFE	FASTER RATE OF CUT
COOLER CUTTING	MORE PIECES PER DRESSING
HOLD FORM BETTER	BETTER FINISH

Typical Reports

Centerless Grinding. "44 ALUNDUM wheels much more versatile; also, time cut on one 14-hour job to 10 hours."

Cylindrical Grinding. "More pieces per dressing and longer wheel life."

Internal Grinding. "Freer cutting, hold form better with less dressing and improved finish."

Snagging. "Faster cutting, better finish, much less depth of burn."

Disc Grinding. "Coil spring production increased from 100,000 to 125,000."

Ball Grinding. "Roughing production increased 46% per wheel, with excellent performance duplication from wheel to wheel."

Thread Grinding. "Hold form better, 50% less dressing, maintain better tolerance with no sign of burn."

Mounted Wheels. "Four times longer lasting, with equal rate of cut."

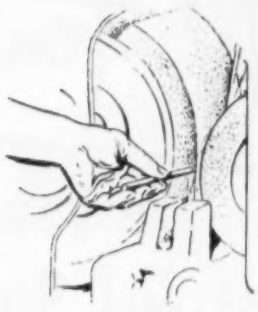
Straight Facts

New 44 ALUNDUM abrasive is not a cure-all. For example, nothing can replace 32 ALUNDUM abrasive for precision grinding on high speed steels or CRYSTOLON* abrasive for most non-ferrous grinding jobs.

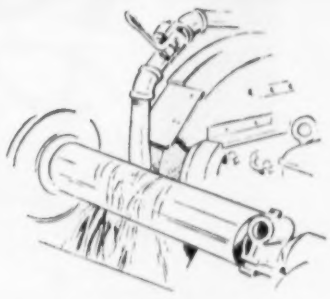
But — on any job where non-premium priced aluminum oxide abrasive is used, "44" will give results ranging from at least equal to very much better. And — "44" has a much wider job range.

Take advantage of this outstanding new abrasive value. See your Norton Distributor for 44 ALUNDUM wheels in the bonds, wheel types and sizes you need. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

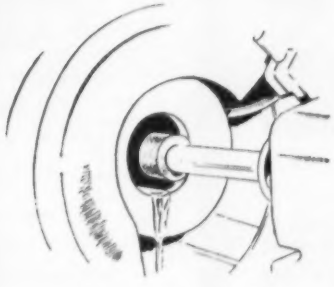
W-1736



CENTERLESS



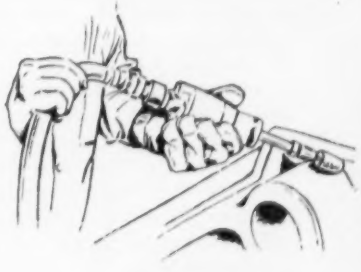
CYLINDRICAL



INTERNAL

SNAGGING

DISC GRINDING



MOUNTED WHEELS

. . . also a standout for saw gumming, ball grinding and thread grinding.

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cat Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Use your Imagination and your Industrial Supply Distributor

Let him help you COUNT your way to Lower-Cost Operation

When you come right down to it, how do you *know* . . . how can you be *sure* of anything . . . *unless you count?* And when you take a calculating look, you'll find that almost every machine, process and system in your plant can be more closely *Count*rolled . . . cost-wise . . . by the addition of Veeder-Root Counters that supply production, payroll, inventory and tax figures, plus a running check on mechanical performance.

It's easy to attach standard Veeder-Root Counters to existing equipment . . . as your Industrial Supply Distributor will show you. And if special counters are needed, he will bring a Veeder-Root engineer to consult with you. So call your distributor today . . . *he's a man you can count on.*

SMALL RESET COUNTER

A compact, rugged reset counter for moderate duty in parts inspection, quality control, conveyors, machine tools, light presses, etc.

Dimensions: 1¾" long, 1 19/64" high, 1 7/16" wide

Speed: Up to 1000 counts per minute.

BOX-TYPE RESET COUNTER

For punch press installations, conveyors, metal-working equipment, die casting, plastic-molding, rivet, spring and wire machining, or any installation requiring a heavy duty counter.

Dimensions: 4¼" long, 2 1/32" high, 3 3/8" wide. Speed: 500 counts per minute.

RESET MAGNETIC COUNTER

For remote indication of machine operation from plant to office.

Dimensions: 3 15/16" long, 2½" high, 1 5/8" wide.

Speed: Up to 1000 counts per minute.

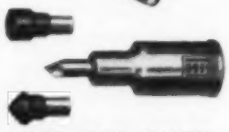
Coils: 110V-AC are standard. Other voltages are available. Panel mounting feature also available.

HAND TALLY

For quick spot-checks of production or performance.

Dimensions: 1 17/64" long (to end of reset knob), 1¾" deep, 2" high.

Counts one for each depression of the thumb lever, and resets to zero by a turn of the knob.



CLUTCH SPEED COUNTER

For checking to make sure that the machine is operating at the required R.P.M.

Dimensions: 3¼" long, ⅞" max. diameter. Non-Reset.

Internal clutch operates counter only when rubber tip is pressed against the shaft.

Insist on Standard

VEEDER-ROOT COUNTERS

from your Industrial Supply Distributor

or write us on special problems

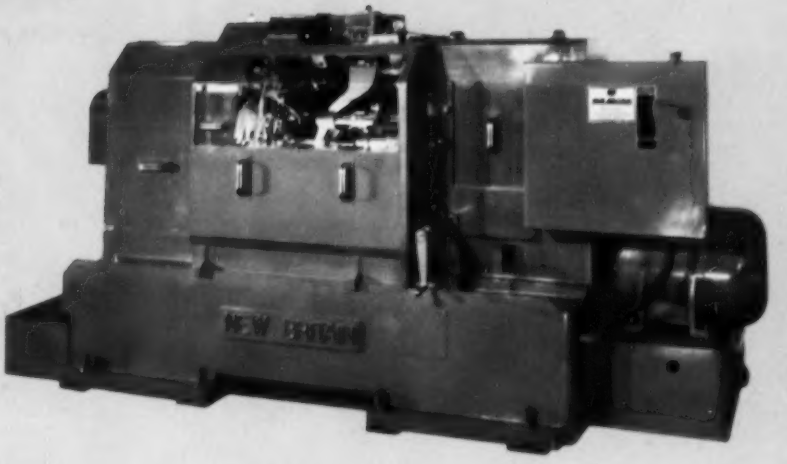
Everyone can count on

VEEDER-ROOT

"The Name that Counts"

WHEREVER YOU TURN
on multi-spindle bar machines
NEW BRITAIN HAS THE MACHINE FOR YOU

THE NEW BRITAIN MACHINE CO.
Model 62
Automatic Bar
Machine
NB



The new Model 62 New Britain bar machine has an independent radial cross slide in every position — opening new possibilities for effective tooling. New Britain "accuracy features" include spindle carrier lifting to eliminate wear during index, plus rigid locking of the carrier during the cutting cycle. Magazine loading available if desired.

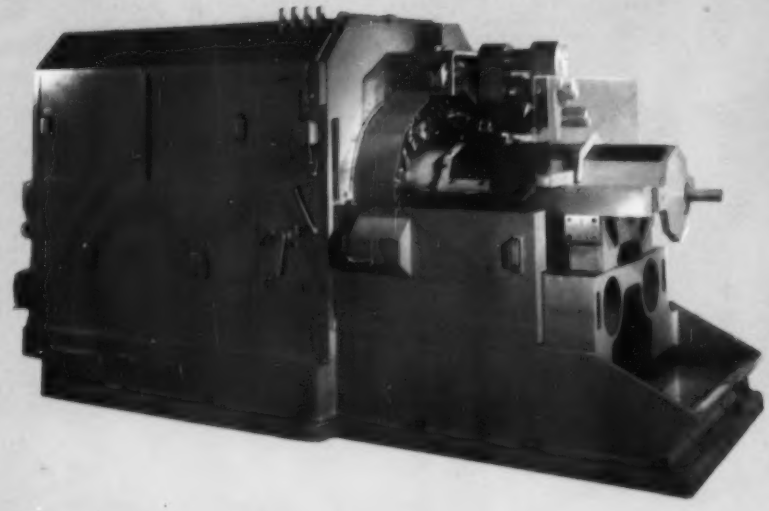
WHEREVER YOU TURN
long or short runs
NEW BRITAIN HAS THE MACHINE FOR YOU

THE NEW BRITAIN MACHINE CO.
Model 11/70
New Britain +GF+
Copying Lathe
NB

The original New Britain **+GF+** copying lathe has grown into an extensive line, to meet the demand for the wide variety of applications for its better copy-turning principle. Regardless of length of run or the variety of pieces you make, you can use the New Britain **+GF+** profitably. Basic advantages are: fast setup, inexpensive tooling, elimination of the chip problem, minimum operator fatigue, and dimensional accuracy with good surface finish to reduce grinding allowances. Optional features include automatic re-cycling, automatic loading and ejecting.

WHEREVER YOU TURN
castings, forgings or pressed metal pieces
NEW BRITAIN HAS THE MACHINE FOR YOU

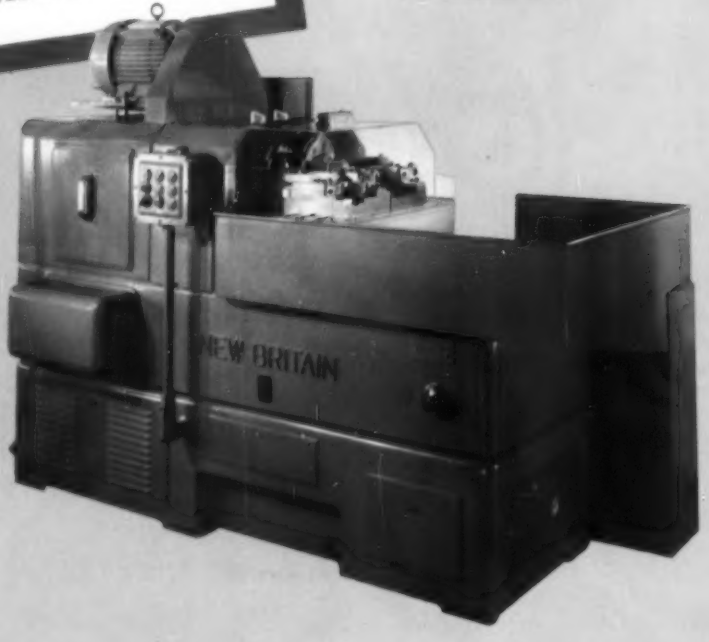
THE NEW BRITAIN MACHINE CO.
Model 810
Automatic
Chucking Machine
NB



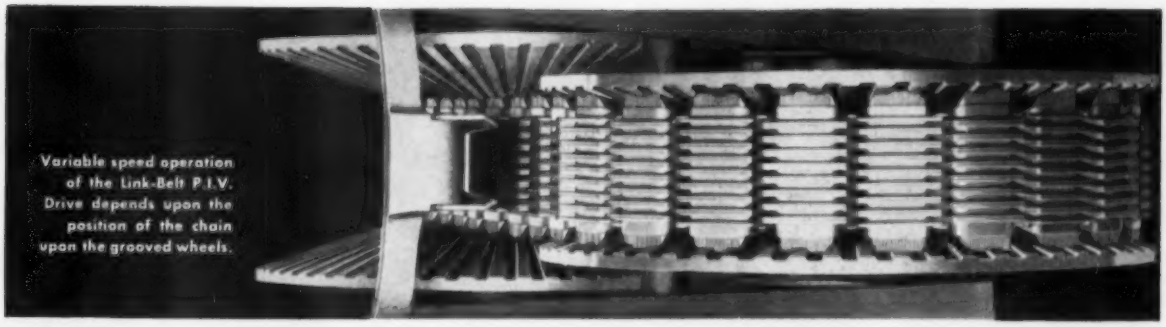
Versatility, accessibility, quick setup and sustained high production of precision parts are what you look for in an automatic chucker. New Britains are famous for these features all over the world. Perhaps you are also thinking of the possible savings which automatic loading, unloading and automatic gauging could effect. If so, you will want to learn about the imaginative use of automated production which New Britain engineers are applying to chucker work these days. You can now handle bigger pieces than ever on New Britains too — up to fifteen inches in diameter.

WHEREVER YOU TURN
or bore precision contour work
NEW BRITAIN HAS THE MACHINE FOR YOU

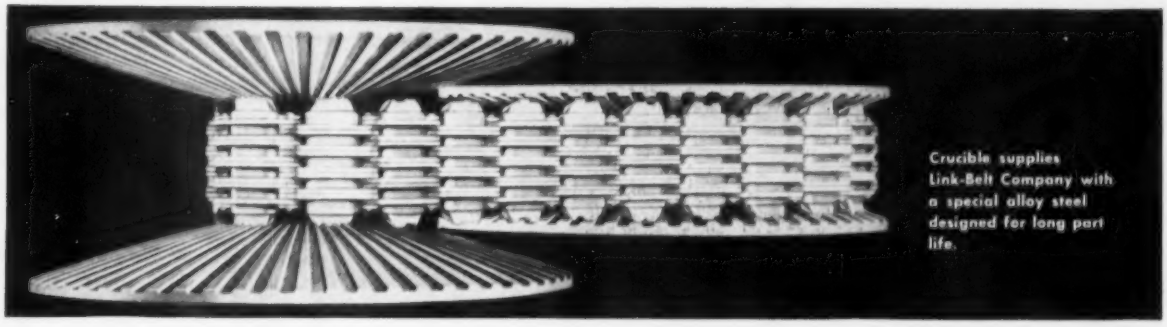
THE NEW BRITAIN MACHINE CO.
Model 37
Precision Boring
Machine
NB



New Britain precision straight and contour boring machines provide a new approach to machining parts that would be problem pieces on any other type of equipment. These simple, fast, accurate machines require minimum attention and utilize inexpensive single point tools. They make the most profitable use of automatic loading, gauging and tool adjustment where these features fit the job requirements. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Variable speed operation of the Link-Belt P.I.V. Drive depends upon the position of the chain upon the grooved wheels.



Crucible supplies Link-Belt Company with a special alloy steel designed for long part life.

these

SPECIAL ALLOY STEEL PARTS

keep Link-Belt's P.I.V. Drive on the job

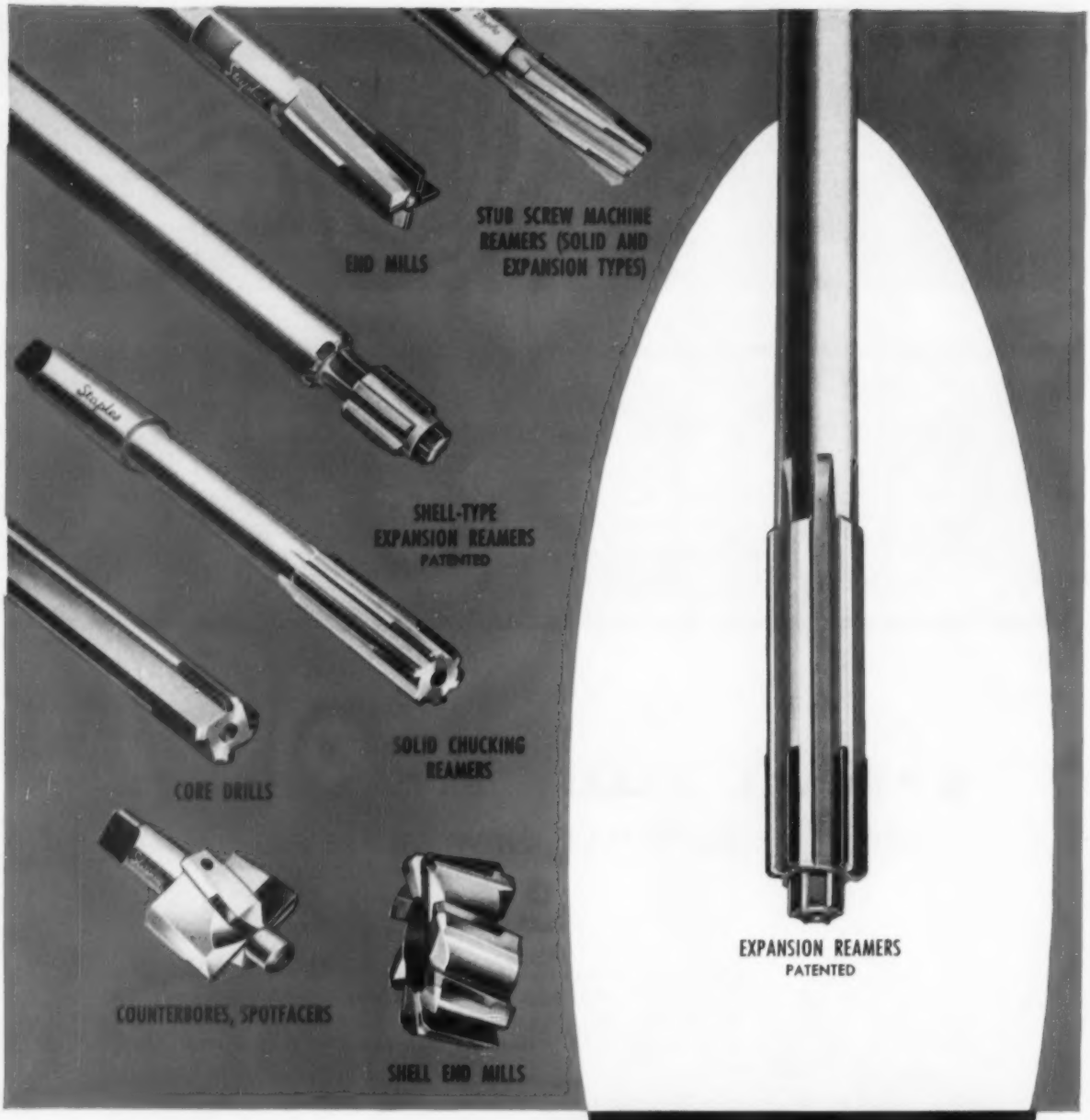
Keeping production operations going at the right speed is the job of this variable speed drive unit produced by Link-Belt Company. Its operation is based on an exclusive drive chain with self-forming metal teeth, which engage with radial grooves in two pairs of cone-shaped wheels.

To make these precision wheels requires a steel that can be readily machined, will not distort, and which has high-strength. That's why Crucible furnishes Link-Belt with a special Nitriding BM alloy steel *designed* for this application. After machining the wheels are Nitrided to obtain a minimum surface hardness of 1000 Vickers Diamond Brinnel — about the hardest surface that can be obtained commercially.

When your application requires a tough, machinable, nondeforming alloy steel — call Crucible. One of our many special alloy grades may be the right one for you — or we can develop one to meet your most exacting demands. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

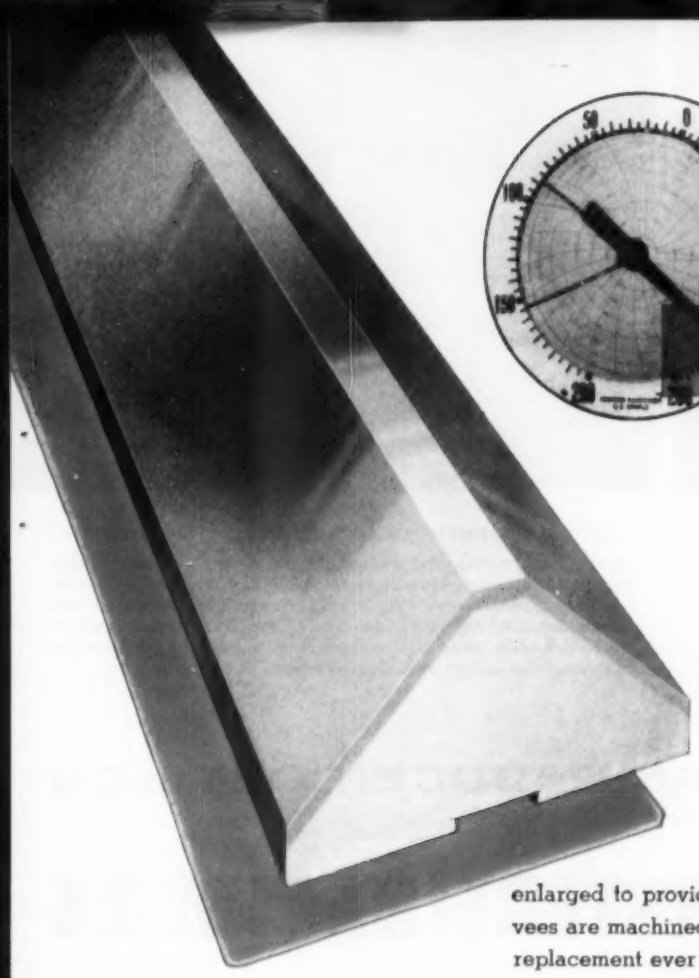


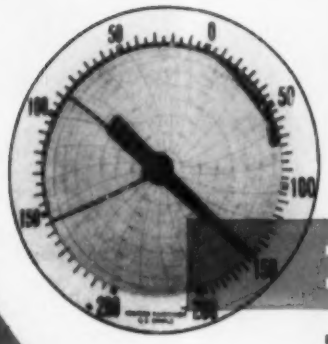
Lower Your Costs With Staples Carbide Tools

Precision and quality built into these tools results in overall economies as proven by production records.

THE Staples TOOL COMPANY
2352 Glendale — Milford Road
Evendale, Cincinnati 15, Ohio

Staples
ROTATING CUTTING TOOLS CARBIDE-TIPPED





150° BELOW

After hardening to 62 Rockwell C the solid tool steel "AMERICAN" Pacemaker bed vees are stabilized in the deep freeze at 150 degrees below zero.

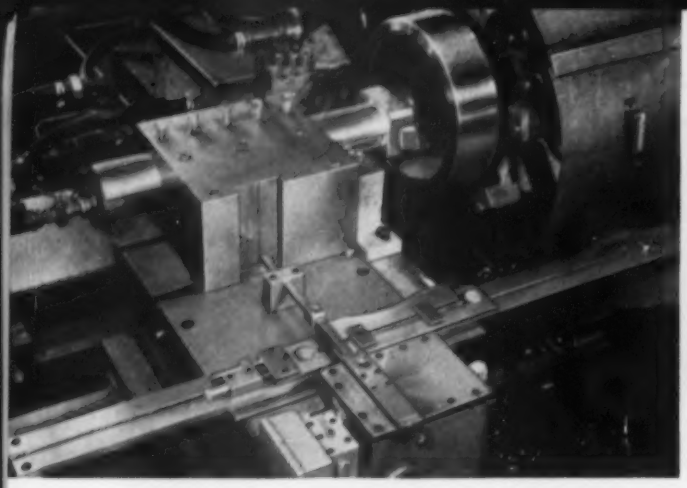
This freezing treatment not only raises the surface hardness but thoroughly stabilizes the metallurgical structure and prevents twisting or warping.

On the new DeLuxe Model "AMERICAN" Pacemaker the bed vees have been enlarged to provide extra large bearing area for the carriage. The vees are machined to gauge tolerances for interchangeability should replacement ever be required.

This is but one of the outstanding advantages offered by the new DeLuxe Model Pacemaker. Others are illustrated and described by bulletin No. 124—want one?

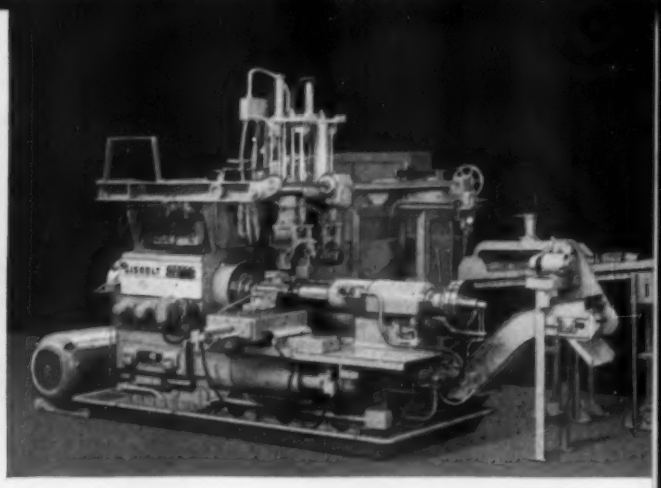
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



NO. 24—WITH CHUCK

Ninety pounds of tough bearing steel are removed in two 8-minute operations on this job. One No. 24 handles six types and 24 different sizes of inner and outer bearing races with ease and efficiency. A JETracer on the rear independent slide simplifies spherical, straight and taper boring operations—also improves accuracy and finish and lowers unit costs.



NO. 24—ON TAILSTOCK-SUPPORTED EXPANDING ARBOR

Automatic loading and unloading are part of the machining cycle on this setup. Utilizing overhead clamps and a traversing carriage arrangement, the No. 24 makes fast work of these tough steel tool joint forgings. The operator has separate push-button control over all machine and handling functions for faster, easier setups and change-overs.

YOU CAN REDUCE COSTS ON

NEW GISHOLT MASTERLINE NO. 24

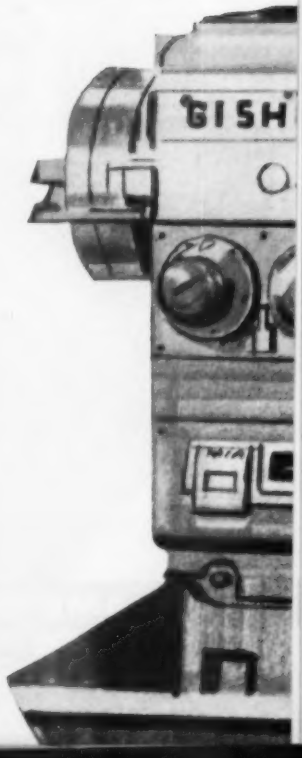
WHETHER YOUR LARGE PART PRODUCTION INVOLVES long, steady runs or small repeat lots, you'll find definite ways to cut costs with this new Gisholt MASTERLINE No. 24 Automatic Production Lathe.

And you can realize these savings whether your work has to be held on an arbor, in a chuck or special fixture, or between-centers with work driver and tailstock—for the big No. 24 will handle parts all four ways.

Cost cutting with this extra powerful (up to 125 h.p.) single-spindle automatic is inherent within its standard automatic cycle. Hydraulic control of all carriage and auxiliary slide movements—plus automatic stopping and starting of the spindle—lets one operator handle two or more of these machines, or perform other jobs during machining time.

Still more savings are realized through faster, easier setup and shorter change-over periods. During setup, all hydraulic actuated movements may be manually controlled. Spindle speeds, feeds and stops are easily changed. This means you can produce a variety of large parts—or handle small repeats—without excessive down time between sizes or jobs.

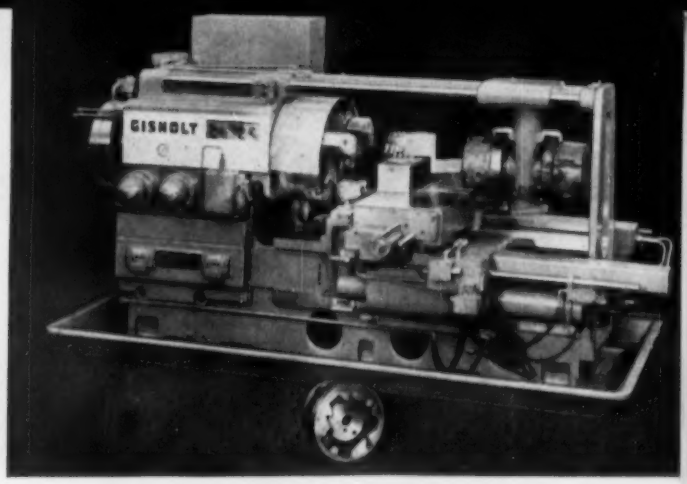
• Whatever type of large part you are producing now—or planning for the future—your Gisholt Representative can show you how and where the No. 24 will produce it for less cost. Call him today—or write Gisholt for complete information.



GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS



NO. 24—WITH CHUCK AND TAILSTOCK SUPPORT

With this setup, husky airplane drive gear and propeller shafts are completed in two fast operations on two No. 24's. One man handles both machines. The first operation is shown. Five diameters are machined plus turning, facing and chamfering. The second operation, on the other end, is similar. Floor-to-floor time: 12 min. per operation with 75 lb. of metal removed.

NO. 24—WITH CHUCK AND LOADING ARBOR

Here, standard tooling plus a unique, indexing-loading arbor arrangement on the No. 24 has cut costs and reduced effort in the machining of heavy cast iron diesel cylinder heads. Floor-to-floor time is only 1.2 minutes. More time is spent making chips because most of the loading-unloading operation is performed while the tools are working on the next part.

LARGE PART PRODUCTION WITH THE

AUTOMATIC PRODUCTION LATHE

There's more in this barrel for you...

James E. Pratt, left, Socony Mobil engineer, obtains performance data on hydraulic system at an aluminum extrusion plant.

MORE ENGINEERS

to help you improve production and cut costs!

Specify Socony Mobil and get the services of more industrial lubrication engineers than are provided by any other oil company.

These specialists, working closely with your Mobil representative, will help you set up a plant-wide program of correct lubrication . . . advise on any lubrication problems that might arise. Their long experience and expert recommendations can improve your production and cut costs.

Socony Mobil products are also backed by *more* services for analyzing petroleum products in use . . . *more* on-the-job training of your personnel in correct product application . . . *more* approvals from machine builders . . . *more* continuous research to assure continually improved products . . . *more* practical experience—90 years!

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY
SOCONY MOBIL

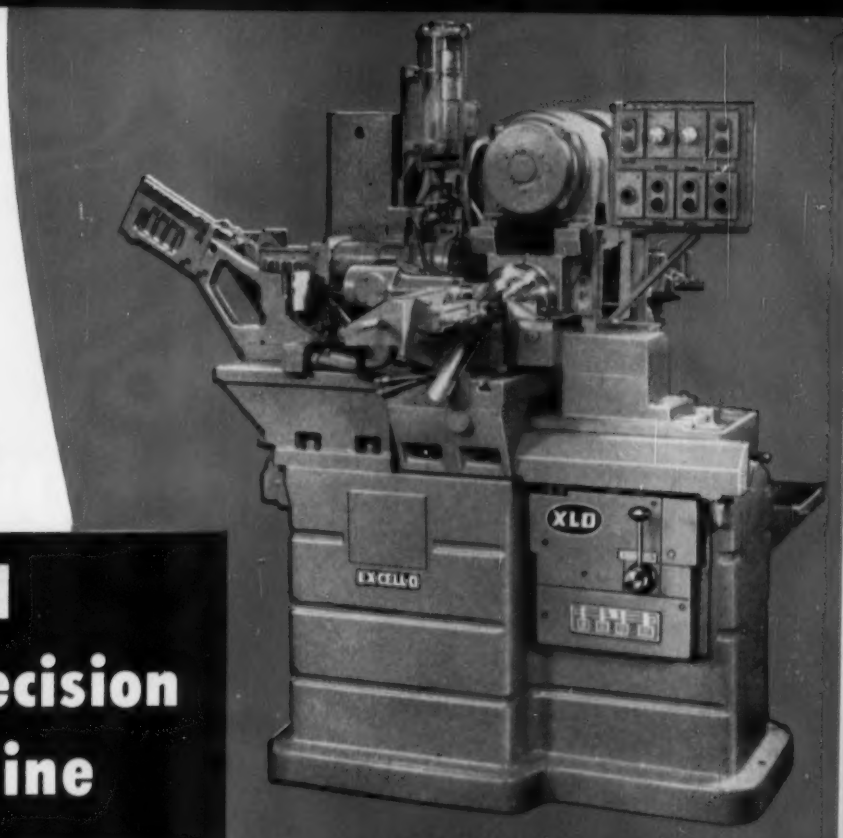
FIRST STEP
IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS

Automatic Handling Speeds Production

On a Standard Ex-Cell-O Precision Boring Machine



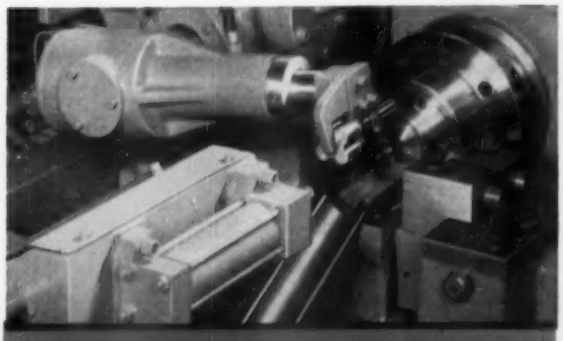
Ex-Cell-O Style 2112-B Precision Boring Machine equipped with a single work spindle and special work handling devices for automatic loading, machining and ejecting.

For a Fraction of Special Machine Cost

This standard Ex-Cell-O Precision Boring Machine is equipped for facing both ends of oil pump impellers. With automatic work handling equipment it operates at a net production rate of 156 pieces per hour. The use of a standard machine keeps the original cost at a minimum.

In a completely automatic cycle a loading arm picks a part from a chute and loads it into the chuck, then the parts are clamped, machined and ejected.

The flexibility of standard Ex-Cell-O Machines permits low cost automated operation with the addition of work handling equipment. Such a machine may be profitable in your plant. Wire or write Ex-Cell-O in Detroit.



The loading arm is about to load the part into the chuck. After machining, part is ejected into chute in foreground.

In straddle facing oil pump impellers (at right) smooth machine performance is imperative. Width limits between faces are held to .0005".

EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

XLO — EX-CELL-O for PRECISION

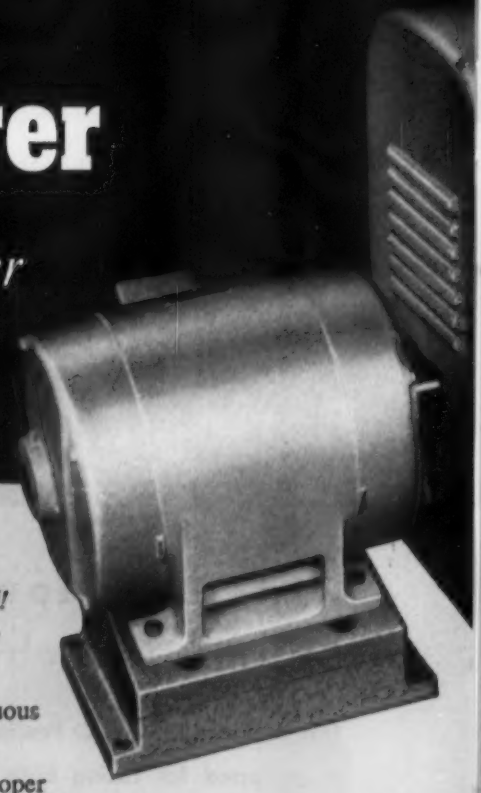
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-17

Now Available from Le Blond...

No. 30 Rapid Borer

to Bore Holes Faster than Ever Before



With the new LeBlond-Carlstedt Rapid Borer, you can bore, trepan or counterbore holes *3 to 8 times faster than by the conventional D-bit method!*

The Rapid Borer was developed expressly to accommodate revolutionary new tooling which cuts at very high speed with good accuracy and finish. Cutting oil is forced between the boring bar and hole wall forming a continuous bearing. It flushes back through a hole in the boring head and bar, carrying away the chips as it goes. Chip form is controlled both by tool angles and proper feed and speed combinations; thus tool faces are kept clean and chip passage clear. Cutter design produces balanced cutting pressures thereby controlling concentricity.

This new tooling requires a machine with the following characteristics, all of which are incorporated in the LeBlond Rapid Borer design:

High spindle horsepower
Ample rigidity throughout
Complete absence of vibration at all speeds
Infinitely-variable feeds (up to 38" per minute), independent of speeds, while running under load
Final drive to spindle through belts
Large volume of cutting oil

Basically, the Rapid Borer is suited to work that is symmetrical for balance in rotation—round, square, octagonal, tapered or stepped. A wide variety of hole diameters and depths as well as work sizes can be accommodated.

Tell us about the holes you'd like to produce faster. Large holes or small. If the Rapid Borer can handle the job, we'll show you how to produce them faster than ever before.

BRIEF SPECIFICATIONS, No. 30 RAPID BORER

Workpiece diameter	¾″ to 6 11/16″	Trepanning or counterboring	2⅜″ max.
Boring and workpiece lengths (max.)	18″, 42″ or 66″	Spindle speeds	Single speed or variable to 2500 rpm
Solid boring	½″ to 1¼″	Main drive motor	30 hp

EXAMPLES OF WORK BORED IN OUR SHOP

1. Drive Shaft, 29½″ x 2⅜″
Blind hole, 25″ deep, .887″ dia.
Material, 4140
Penetration rate, 6¼″/min.
Floor-to-floor, 5.5 minutes
Old method* floor-to-floor, 29.2 min.

2. Barstock, 13⅛″ x 2⅜″
Through hole, 1,062″ dia.
Material, C1141
Penetration rate, 7¼″/min.
Floor-to-floor, 3.2 min.
Old method* floor-to-floor, 19.4 min.

3. Barstock, 10 13/16″ x 2⅛″
Through hole, 775″ dia.
Material, C1141
Penetration rate, 7″/min.
Floor-to-floor, 3.03 min.
Old method* floor-to-floor, 14 min.

** Old method—conventional D-bit*

...cut with confidence

The R. K. LeBlond Machine Tool Company

Cincinnati 8, Ohio

World's Largest Builder of a Complete Line of Lathes for more than 69 Years

LeBLOND of Cincinnati

Extra Rugged...

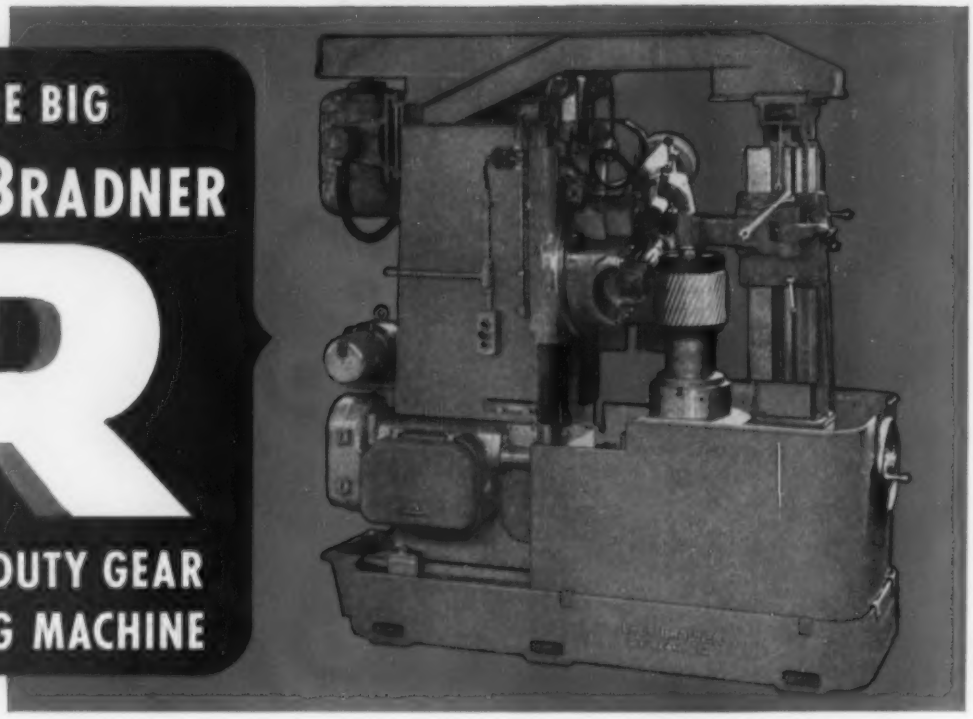
For The ROUGH Hobbing Jobs!

THE BIG

LEES-BRADNER

R

HEAVY-DUTY GEAR HOBBING MACHINE



Built rugged and reliable to handle those rough, tough gear hobbing jobs . . . that's the new Lees-Bradner Model "R".

It's designed to hob spur or helical gears up to 1¼ DP with a left or right hand maximum helix of 45°.

The Model "R" features fast loading and unloading, ready access to index and feed change plus easy operation and maintenance.

Write for your free brochure giving the detailed capacities and specifications of this new heavy-weight hobbing machine.

SPECIFICATIONS

Maximum outside diameter with tailstock column	16"
without tailstock column	18"
Minimum C/D hob to work	1½"
Maximum C/D hob to work	12"
Travel	18"
Maximum diameter of hob (3-1, 6-1, or 12-1 backgearing)	10" x 10"
DP range	1¼ DP to 16 DP
Maximum manual (or electric) shift of hob	6"
Diameter of hole through work spindle	2"
Machine weight	13,000 lbs.

the **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO • U.S.A.

A DIVERSIFIED LINE OF QUALITY

Write on your company letterhead for our new Carbide Tool Catalog. Address Dept. 3C

UNION

When the work calls for carbide cutting tools — tipped or solid — you can count on Union to supply them. The right grade of carbide will have been carefully selected to serve your exact purpose on the material you wish to machine.

Specify Quality Union Tools for all your cutting needs.

UNION TWIST DRILL COMPANY

ATHOL • MASSACHUSETTS

Owners and Operators of: **S. W. CARD COMPANY DIVISION, Mansfield, Mass.**
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Que.

"SKIL Drills...

stay on the Job twice as long"

says **George Behling,** Superintendent
The Day Company
Minneapolis, Minnesota

"Nothing is so irritating as to have a unit fail on the job," according to Mr. Behling. "In our business, grain and cement dust are a constant source of electric tool failure. With SKIL Model 75 Drills, however, we have far less trouble than with any other make.

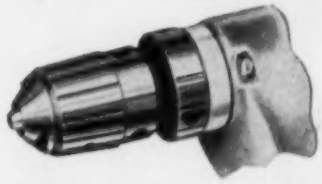
"Our mechanics prefer SKIL Drills. They have extra power and are easier to handle. One other plus feature is the service we get from the local SKIL people, when needed. Our choice of electric drills is SKIL, for long life—ample power and ease of handling."

These Are Some of the Model 75 Features That Make So Many Firms Choose SKIL

- **55% more powerful, yet lighter in weight.**
- **Choice of 7 speeds (500 to 5,000 r.p.m.).**
- **Handy, safety-designed trigger lock for continuous operation—side location for easy use.**
- **All anti-friction bearings for longer life.**
- **Large inspection plate for routine maintenance.**
- **Comfortable "contour-grip" handle.**

When you buy a drill, be sure it's a SKIL.

New Keyless Chuck* speeds bit changing...ends key fumbling!



Now the famous SKIL 75 Drill offers fresh working advantages with high-torque keyless chuck. Gripping power is even greater than with a keyed chuck. Highest accuracy, fine balance, with the shortest overhang of any keyless chuck made! Tightens by hand—no more keys to lose. *Optional at slight additional cost.

FREE! Send this coupon. Your SKIL Distributor will give you a no-obligation demonstration. See how you can increase performance with Model 75 SKIL Drill.

SKIL
PORTABLE POWER TOOLS

Made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in ALL Leading Cities

SKIL Corporation, Dept. AM-116
5033 Elston Avenue, Chicago 30, Illinois

☐ I would like a demonstration and FREE trial.
☐ Please send literature on SKIL Drill..

Name _____

Address _____

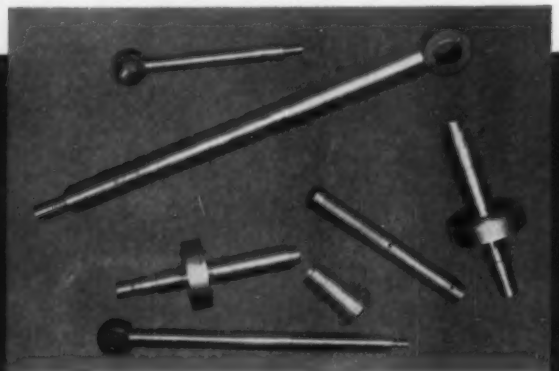
City _____ Zone _____ State _____

80% Production Increase

on miscellaneous TURNING JOBS!

The Frank G. Hough Co. of Libertyville, Illinois, manufacturers of the famous "Payloader," use this Sundstrand multi-cycle tracer

with **SUNDSTRAND** Automatic Lathe equipped with Multi-Cycle Tracer Control . . .



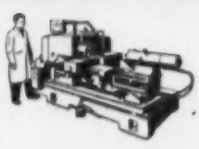
Illustrated above are several parts that are machined on this Sundstrand Automatic Lathe with Multi-Cycle Tracer Control.

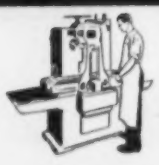
SUNDSTRAND

"Engineered Production" Service

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





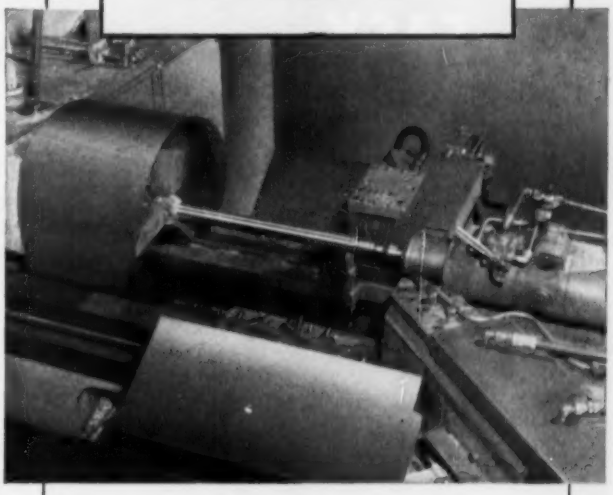
controlled automatic lathe for turning various parts as illustrated.

Multi-cycle single point turning of irregular shapes can be obtained quickly and easily with Sundstrand Automatic Lathes equipped with this tracer control. The lathes are provided with a template controlled tracing unit, which replaces the regular front carriage. Ruff, semi-finish and finish cuts can be made with one turning tool in one automatic cycle and with *one* template. The control can be set up for one, two, three or four automatic cycles depending on job requirements. The regular cross feeding rear slide can be used to square up shoulders, chamfer, etc. Cycle changing is quick and easy requiring only 15 to 45 minutes depending on job and number of facing tools required in the job set-up.

LOT SIZES VARY FROM 1 TO 200 PIECES

The 18 different parts that are machined on this lathe vary in lot sizes from 1 to 200 pieces. The ease of set up and automatic cycle make it practical to run either small or large lots.

A TYPICAL EXAMPLE



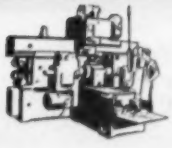
This machine is a Sundstrand Model 8A Automatic Lathe with Multi-Cycle Tracer Control. This lathe performs turning, facing, chamfering and grooving operations. A total of 18 different parts, consisting of shafts, piston rods, gears, and couplings are machined on this lathe. These parts are of steel and cast iron.

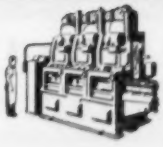
The former method of machining required the use of two machines, an engine and a turret lathe. This one Sundstrand Multi-Cycle Tracer Lathe combined the operations performed by these two machines to give a production increase of 80%.

Get these Additional Facts

This folder will give you the facts you will need to determine the possibility of applying this machine to your work.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

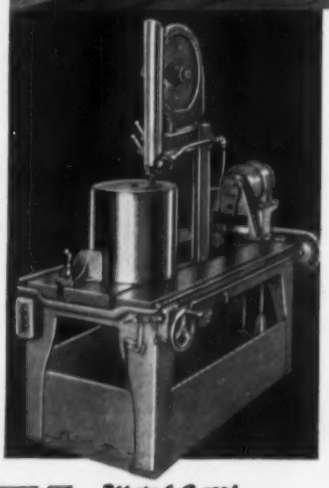
MARVEL NO. 8 BAND SAW makes a tough job EASY...

FLOOR TO FLOOR IN 5 HOURS... no special jigs, fixtures or set-up required

The versatility, simplicity of operation and unmatched efficiency of a MARVEL No. 8 Universal Metal Cutting Band Saw makes it the best all-around saw you can buy.

Take the job illustrated, as an example. Three equally spaced re-entrant cuts were required to segment a large, heavy die forging. The work was merely placed on the table between the vise jaws with the first lay-out line positioned to bisect the blade. Feed pressure was set on the direct-reading scale and the cut started. On a MARVEL No. 8, the work is always stationary and the blade is fed into the work; the cutting edge of the blade is always square with the table throughout its full feed traverse, which eliminates the need for special fixtures. The pre-set Automatic Overload-Relief Power Feed kept the blade moving into the work only as fast as it could freely remove the metal; as the vertical length of the cut decreased, the blade was automatically fed faster, thus increasing cutting speed. Upon completion of a cut, the blade was rapidly returned to its starting position by a rapid traverse handwheel located at the operator's position. Succeeding cuts were made in the same manner, with the same ease and speed.

Jobs like this aren't done every day, but they serve to emphasize the versatility of the MARVEL No. 8, a truly universal metal cutting saw. If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.



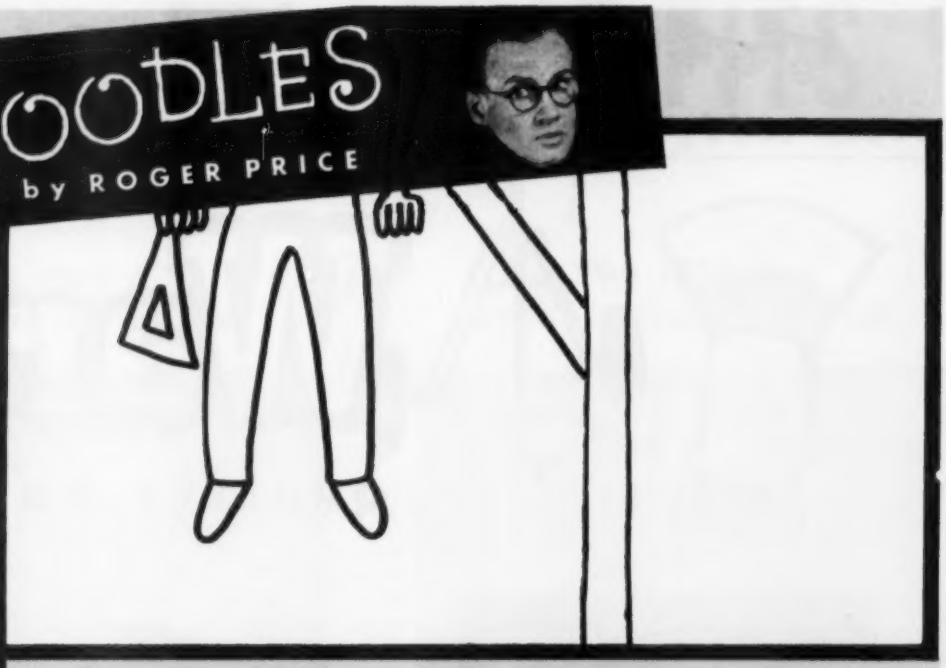
ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

MARVEL Metal Cutting SAWS
Better Machines–Better Blades

S-1302

DROODLES

by ROGER PRICE



J&L

Bench Model BC-7D

Floor Model FC-30

Floor Model FC-14

Table Model TC-14
(Vertical Inspection)

"HIGH-STRUNG ENGINEER"

This cleverly-drawn Droodle is just a joke, because everyone knows that engineers really aren't high-strung at all. They're all rugged, handsome, good-natured chaps who puff placidly on bulldog briars while they're doping out various ways to square the circle, and how to get another year out of the family jalopy. Oh yes, I was an engineer once! Until one day the boss, who was inspecting one of my blueprints, remarked "Price, you're funny!" On the spot, I decided to become a humorist. That's the very same spot I was fired on, incidentally.

Not at all incidentally, I'd like to put in a good word for a friend of mine, the Jones & Lamson Optical Comparator. This precision-built instrument is used throughout industry to inspect and measure all sorts of parts and objects. The J&L Comparator is speedy, and accurate to .0001". It's extremely flexible, too . . . can be used for the toughest inspection jobs, and pays its own way both in production-line and job-shop work. Available in eleven bench and floor models. Get all the details on Jones & Lamson Comparators . . . write to Dept. 710 *today*.

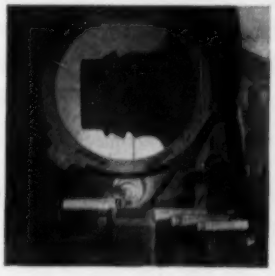
JONES & LAMSON OPTICAL COMPARATORS *On the Job . . .*

at Ingersoll-Rand Company, Phillipsburg, N. J.

A J&L Comparator performs production-line inspection of form tools and gages. This helps to minimize scrap, and insures top quality in the manufacture of rock-drilling equipment.

at A. H. Wirz Inc., Chester, Pa.

A J&L Comparator checks the necks, threads and other elements of the many different sizes and types of fold-up metal tubes, that are used for cosmetics, pharmaceuticals, etc.



JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 502 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

name _____ title _____

company _____

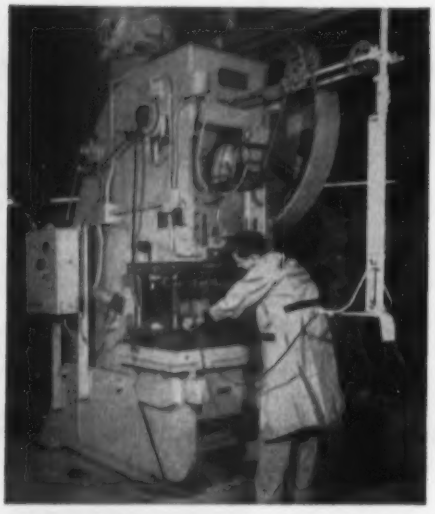
street _____

city _____ zone _____ state _____

From caddy carts . . to cameras . .

Warco®

QUALITY PAYS OFF



Below—Robert Lonze, partner in Era Tool & Engineering, and Raymond Heldt, plant superintendent, looking over a scale case that has just been shaped on the Warco 150 ton Straight Side Press in background.

Leading Chicago metal fabricator likes Warco Press dependability!

"The demand for fast production of a wide variety of stampings calls for most dependable press equipment and that's why we like Warco Presses." This from Robert Lonze, partner in Era Tool & Engineering Co., of Franklin Park, Illinois, one of the Mid-West's leading metal fabricators.

"We first became acquainted with Warco during the war. The ease of operation acclaimed by our press operators, plus the extremely low maintenance requirements, were two of many outstanding features that thoroughly convinced us Warco builds rugged, practical and dependable press equipment.

"Whenever the need for an additional Press arises, we here at Era Tool will give Warco first consideration."

Federal® WELDERS

The Federal Machine and Welder Company

Warco® PRESSES

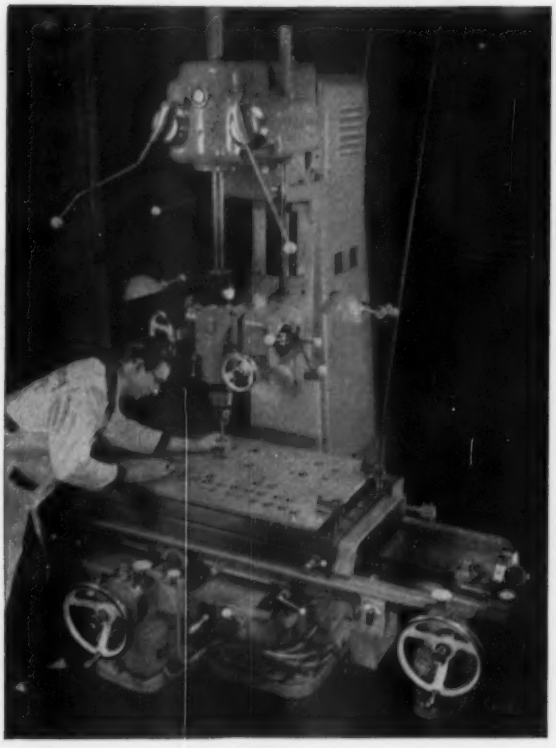
WARREN, OHIO

BUY Precision THAT FITS...!

for tenths
YOU NEED A
CLEEREMAN JIG BORER

OR

for .001"/foot
YOU NEED A
LAYOUT DRILLING MACHINE



If your work involves gages, jigs, fixtures, or "jigless" production with ultra-fine tolerances, one of the three models of Cleereman Jig Borers is the answer.

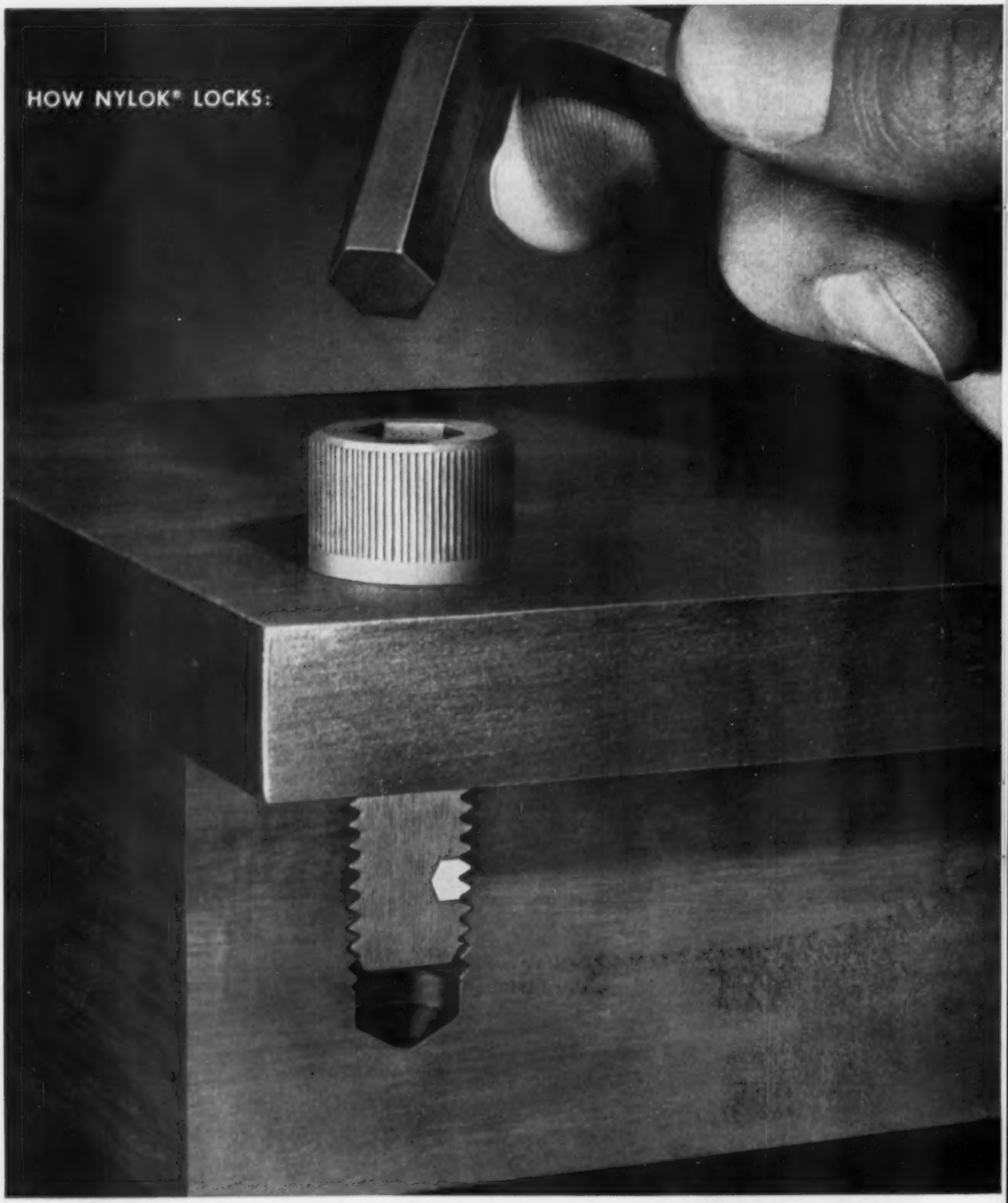
But when your work calls for tolerances of .001" per foot, the economy of the Layout Drilling Machine is the "common sense" approach to your problem.

There are installations near you. Your Cleereman distributor can answer your questions and arrange an inspection visit for you.

BRYANT
Machinery & Engineering
• Company •
General Office
555 West Washington Blvd., Chicago 6
Representatives in Principal Cities

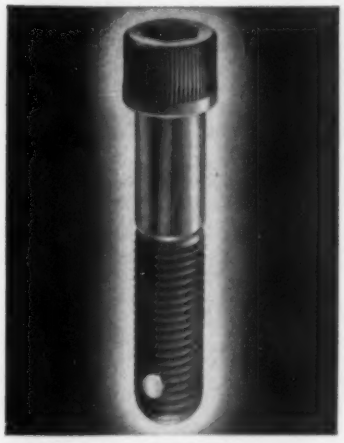
CLEEREMAN MACHINE TOOL CORP.
GREEN BAY, WISCONSIN

NEW—self-locking UNBRAKO

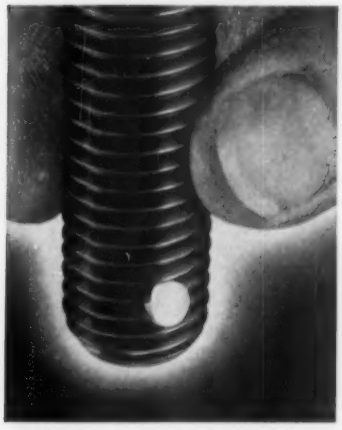


LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

socket head cap screws



Self-locking UNBRAKO socket head cap screw.



BEFORE ASSEMBLY. The nylon pellet projects slightly. When assembled, threads will be impressed into it.

AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

They won't work loose. And they simplify design and save production time.

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOS are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

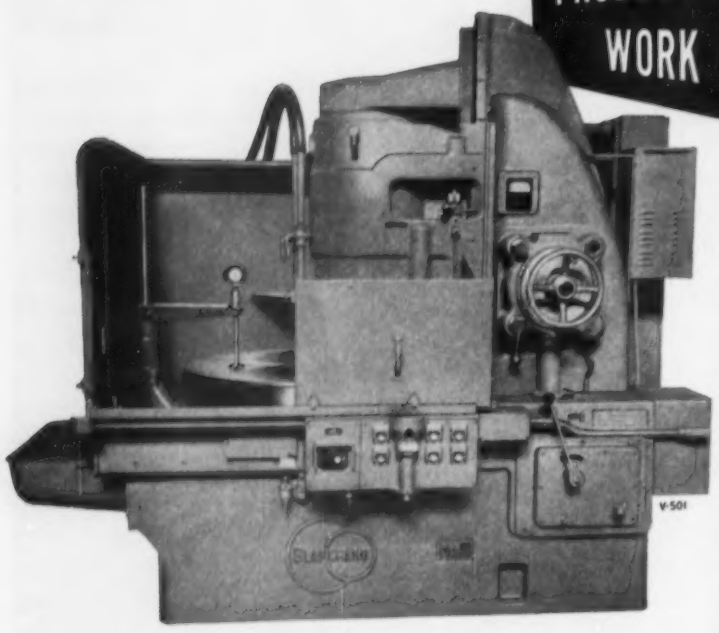
UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

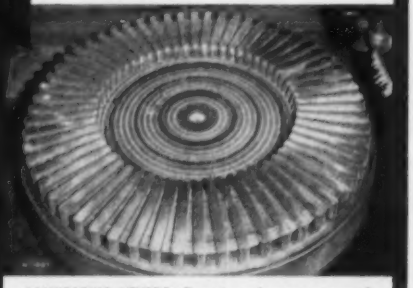
JENKINTOWN ■ PENNSYLVANIA

for BEST results in surface grinding...
PUT IT ON THE BLANCHARD



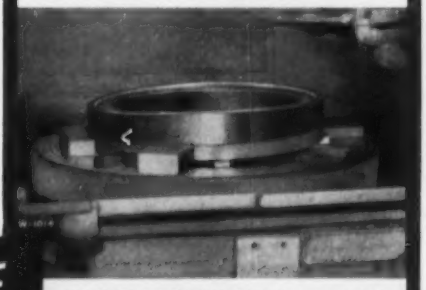
PRODUCTION WORK

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.



CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.

GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18" x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

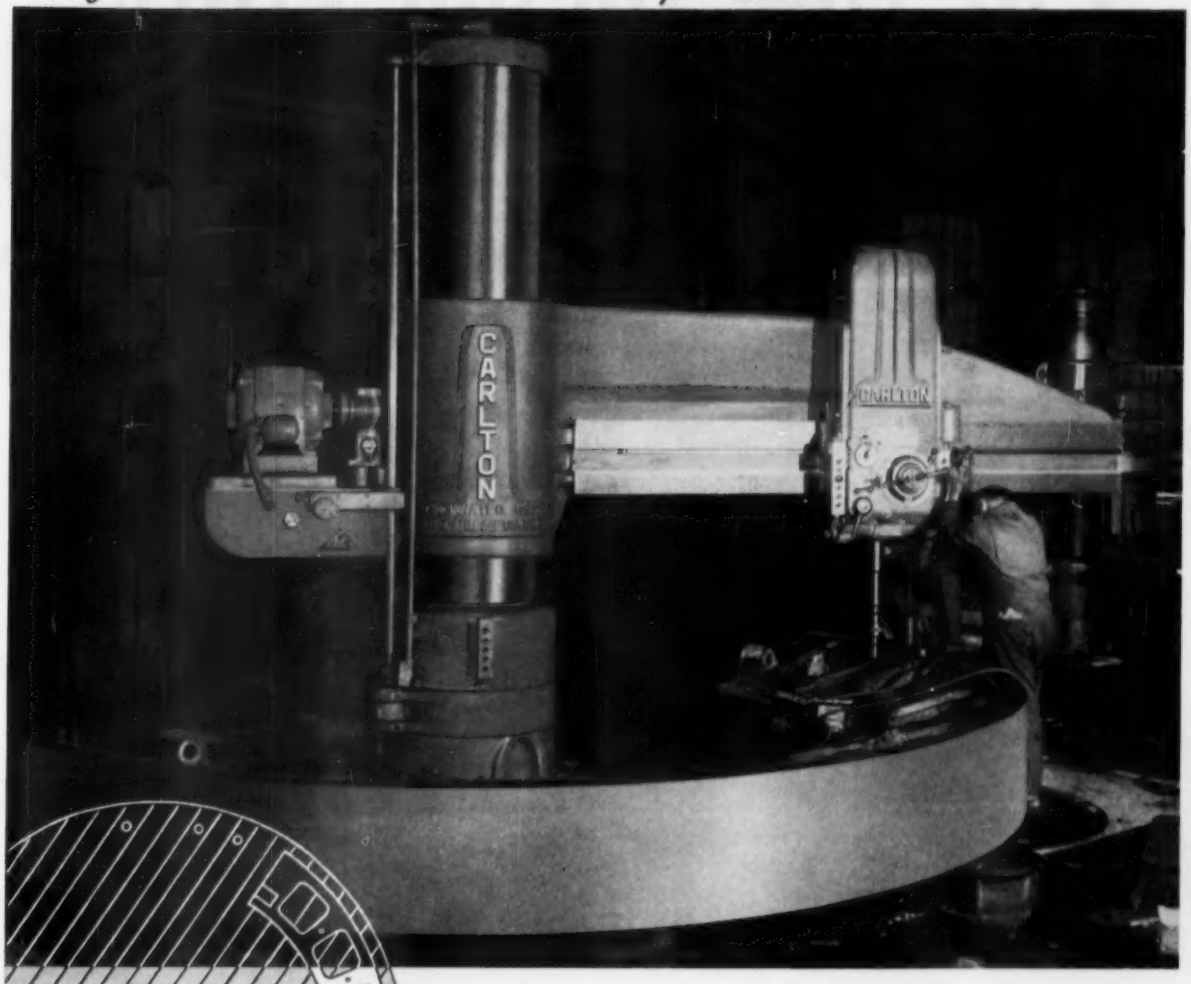
Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

PUT IT ON THE BLANCHARD

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Only **ONE** *can be called the finest.....*



CARLTON GETS AROUND...

...drills even the most difficult jobs easily, quickly and efficiently

Enormous capacity of the Carlton 5A radial drill (10-ft. arm, 26" diameter column) allows you to drill all the holes in your large castings *at one setting*. This saving in reduced handling time is matched by precision accuracy—with Carlton you drill it right the first time.

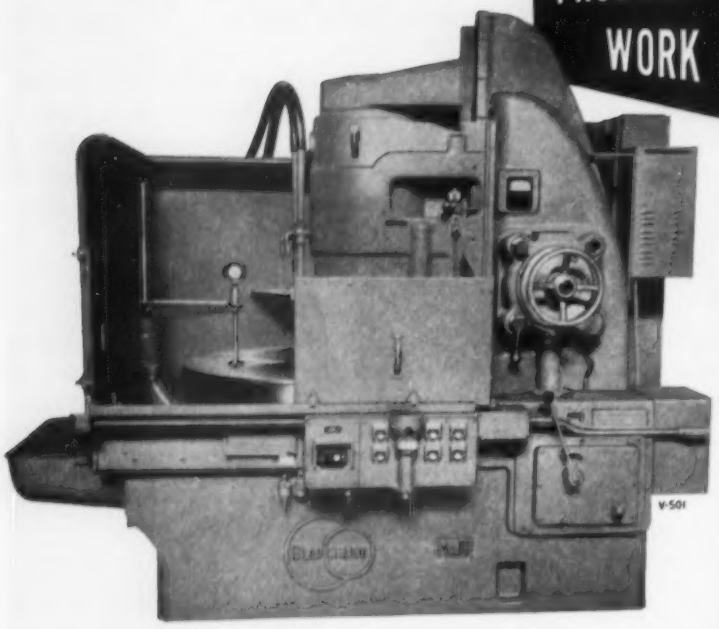
You benefit in many other ways with Carlton radial drills: pushbutton control, super-precision column clamp, low-hung drive, positive tooth feed clutch and easy, economical maintenance. Check Carlton and you'll buy Carlton, the completely modern radial drill.

Arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26". Send today for descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton

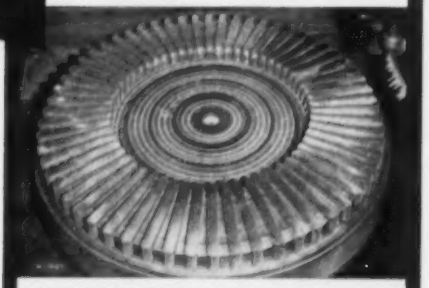
radial and horizontal drills

for BEST results in surface grinding...
PUT IT ON THE BLANCHARD



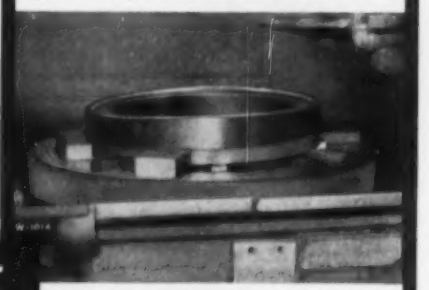
PRODUCTION WORK

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.



CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.

GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18" x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

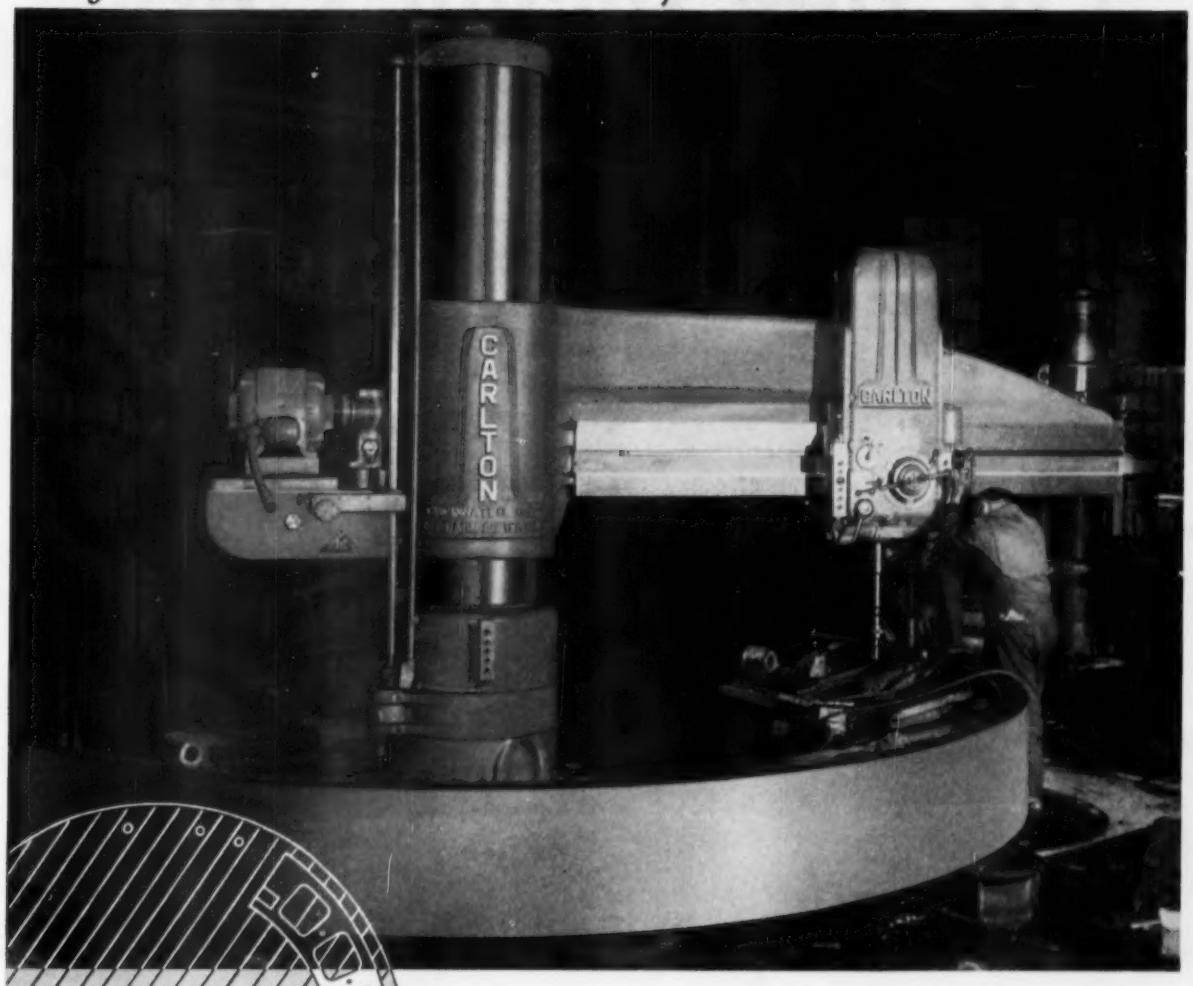
Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

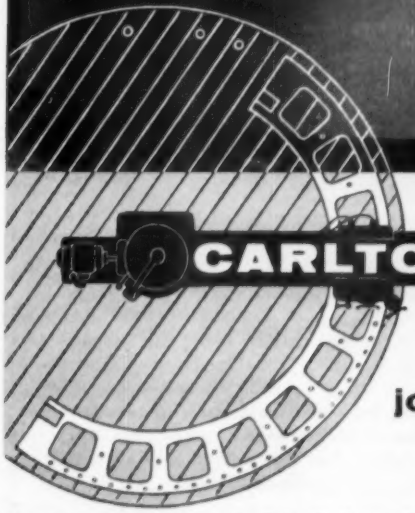
PUT IT ON THE **BLANCHARD**

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Only **ONE** *can be called the finest.....*





CARLTON GETS AROUND...

...drills even the most difficult jobs easily, quickly and efficiently

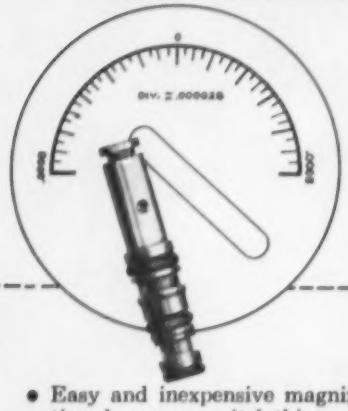
Enormous capacity of the Carlton 5A radial drill (10-ft. arm, 26″ diameter column) allows you to drill all the holes in your large castings *at one setting*. This saving in reduced handling time is matched by precision accuracy – with Carlton you drill it right the first time.

You benefit in many other ways with Carlton radial drills: pushbutton control, super-precision column clamp, low-hung drive, positive tooth feed clutch and easy, economical maintenance. Check Carlton and you'll buy Carlton, the completely modern radial drill. Arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. Send today for descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton
radial and horizontal drills

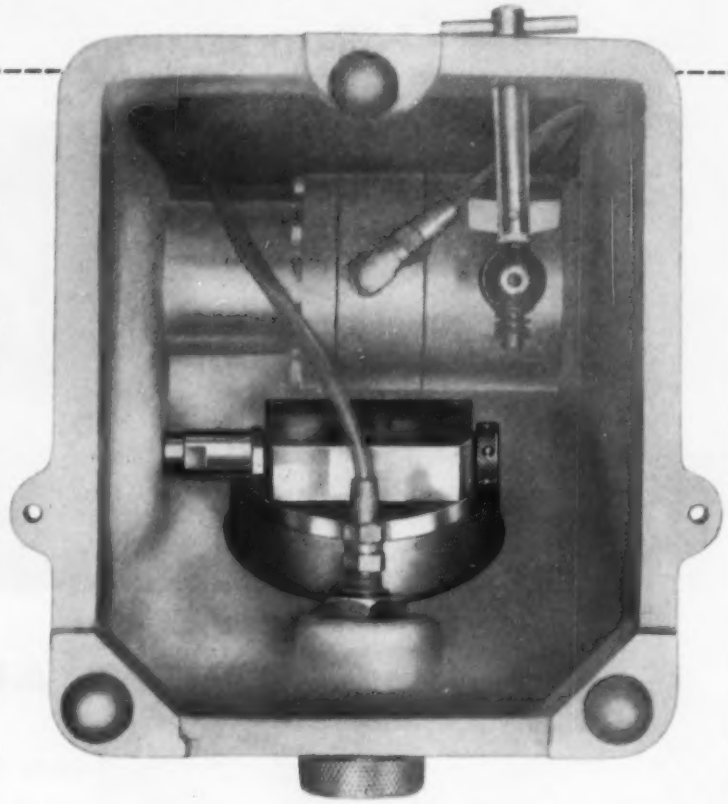
Get this Inside Story

for Lower-Cost Air Gaging



This simple venturi tube, and its corresponding dial, is the real key to more accurate, more trouble-free air gaging performance. The Taft-Peirce CompAIRator uses this tube in a unique *Venturi Circuit* which provides advantages not found in any other type of air gage. Check these exclusive extras . . .

- Easy and inexpensive magnification changes — switch this venturi and dial in just five minutes
- Only 10 pounds operating pressure, cuts air cost in half
- Fast reaction permits remoting base unit from fixture without using "booster" — no time lag or lowered sensitivity
- Velocity-type venturi circuit permits checking smallest diameters with standard gaging members — ID's down to .055″
- Wide tolerance range: can gage tolerances as narrow as .0001″, or can be designed to check as wide a range as .125″
- Full linearity through 180° of dial scale
- Built-in fast response, easily tied in with automatic machining and inspection operations
- Can be mounted at any angle without disturbing readings



The simple Venturi circuit, extreme flexibility, and trouble-free operation make Taft-Peirce Air Gaging your lowest-cost quality control tool — whatever the production rate. It has been proved in hundreds of installations, performing all kinds of gaging operations.

Get ALL the facts . . . from your nearest Taft-Peirce representative, or write direct for Air Gage Catalog No. 613.

Taft-Peirce Single Dial CompAIRator, complete with plug and masters. CompAIRators are also available in double or multi-dial units, can be used with standard air plugs, air rings, and air snap gages — directly attached to cabinet or to air hose. Special fixtures designed and built to order.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, RHODE ISLAND

T-P Means TOP Precision

GOOD EXAMPLE

of the special machine tools Consolidated can build for you

30 feet high and weighing 140 tons, this Betts 100" worm-and-rack-driven slotter was built for one of the country's leading manufacturers of electrical equipment.

The ram is driven by a variable-voltage, adjustable-speed, direct-current motor. The table, in addition to cross, longitudinal and circular feed, and traverse movements by means of separate variable-voltage motor, has an electrically controlled indexing device. Ram guide and ram stroke adjustment are also electrically controlled.

Next time you're in the market for precision metal-working equipment remember this huge slotter . . . and remember the company that built it. Consolidated has produced more types of machine tools than any other company in the United States.

Detailed information on any of the products listed will be sent on request.

CONSOLIDATED MACHINE TOOL DIVISION
Farrel-Birmingham Company, Inc.
Rochester 10, N. Y.
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

CONSOLIDATED MACHINE TOOLS

Engine Lathes • Vertical boring and turning mills • Floor and planer-type horizontals • Planers, double housing and openside • Planer-type milling machines • Plate edge planers • Vertical slotters • Rotary and straight-line production-type milling machines • Skin mills for aircraft manufacturing • Circular cold saws • Railroad wheel and axle machinery • Special machine tools.

New ARMSTRONG *Armide* CARBIDE INSERT TOOL HOLDERS

Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD**—speeds indexing of inserts.
- **REPLACEABLE SEAT of Hardened Tool Steel**—protects shank and provides flat base to prevent damage to inserts as they are clamped in position.
- **SHANK of Heat Treated Alloy Steel**—gives extra strength and rigidity.

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert, reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

Buy ARMSTRONG TOOLS from your Industrial Distributor

Write for catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

Square locked head maintains ACCURATE alignment

Box section arm fully encloses driving shaft

100% Anti-friction bearings

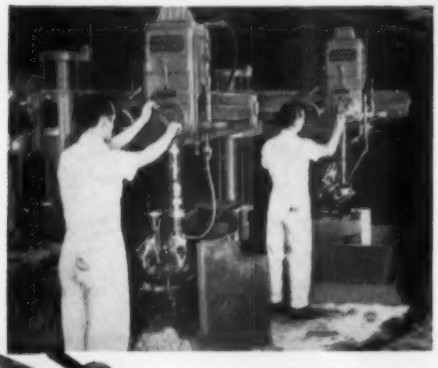
Head in perfect balance on arm

Arm swings with finger tip ease

No driving clutches

LONG LIVED ACCURACY

in this high speed Super Service Radial!



Drilling, Core Drilling and Reaming Alloy Steel Cheek and Counterweights of Aircraft Engine Crankshafts. Reamed holes are held accurate within .0005".

3 and 4 foot arm.

Spindle speeds up to 3500 r.p.m. without belts.

This simplified, very versatile, speedy, accurate and durable machine is rigid and easy to handle.

A distinctive feature is the elimination of spindle driving clutches as forward and reverse rotation is thru a reversing motor . . . very fast for tapping work.

Furnished with 9″ column with 3′ or 4′ arm and 3 HP driving motor.

Get the details. In their range, these machines are most economical and productive.

Write for Bulletin R-21C.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

Do the **BIG** jobs . . .
and the small ones too
on a **BRYANT**

MODEL 1460 Hydraulically operated. Chuck swing of 60", total wheelside stroke of 21"; maximum grinding stroke of 16".

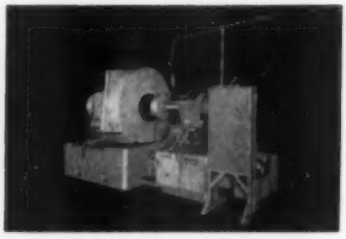
No matter what your internal grinding problem may be, it can be solved effectively with a Bryant Internal Grinder.

Bryant's great variety of manual, semi-automatic and automatic grinders is your assurance of a machine that is tailored to meet your production requirements.

Investigate how Bryant's engineering services can help you attain higher production at lower operating costs.

MODEL 1109 A precision internal grinder, suitable for covering the range of smaller bore sizes. Total swing of 9"; maximum grinding stroke of 3½".

MODEL 1116 Tops for both toolroom and general production work. Total chuck swing 16"; maximum grinding stroke 8".



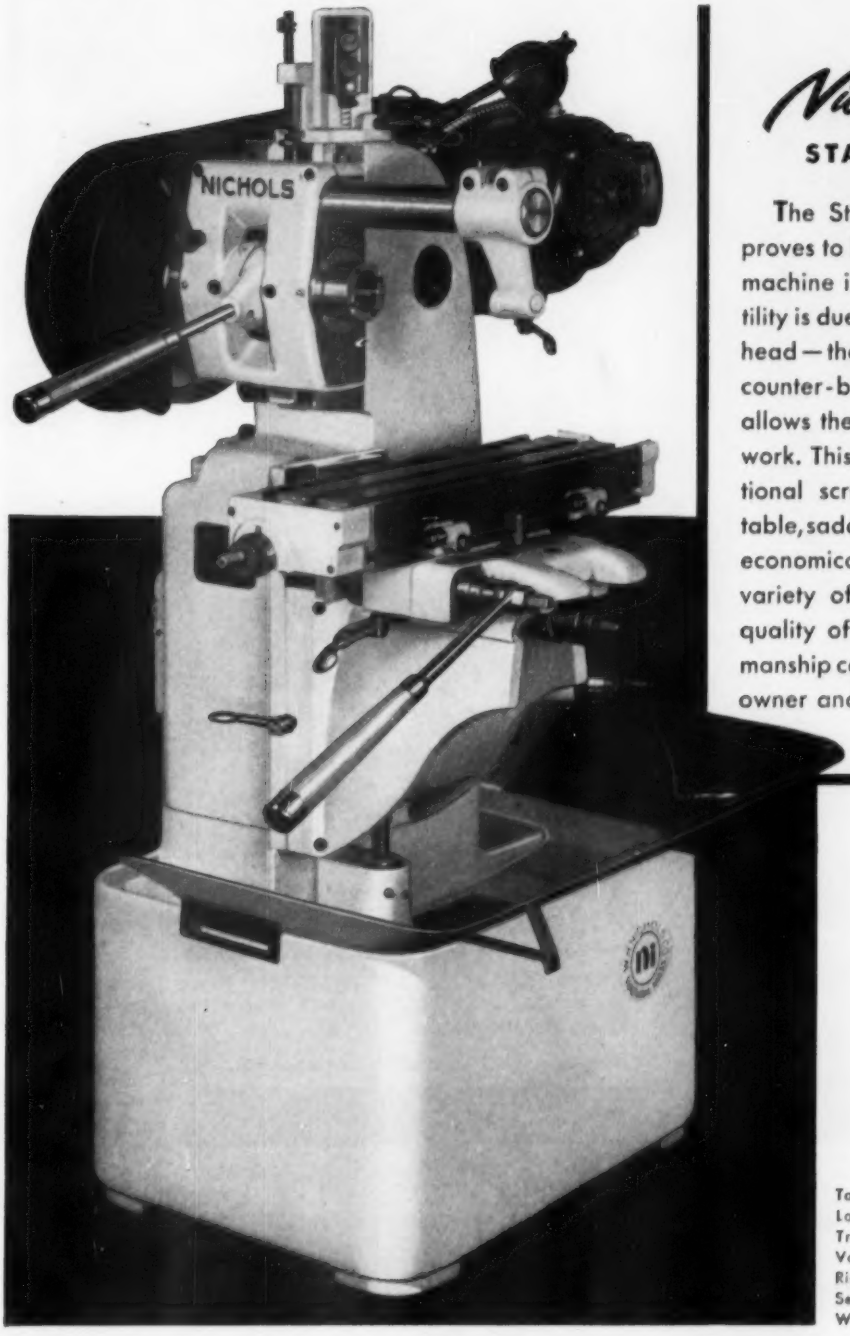
MODEL 1480 Total chuck swing of 80". Spindle has a 9" bore so work can be extended back if necessary.

BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery



Nichols Miller

STANDARD MODEL

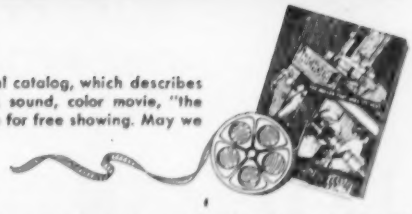
The Standard Nichols Miller often proves to be the handiest (and busiest) machine in the shop. Its unusual versatility is due to the "rise and fall" spindle head—the spindle being mounted in a counter-balanced sliding head which allows the cutter to be brought to the work. This unique feature, plus conventional screw or lever movements of table, saddle and knee, guarantees fast, economical production on the widest variety of parts. And the unexcelled quality of Nichols' design and workmanship commands the respect of every owner and operator.

"the miller that uses its head!"

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21" or 30"
Longitudinal Travel	10" or 19"
Transverse Travel	7"
Vertical Travel—Knee	13¼"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

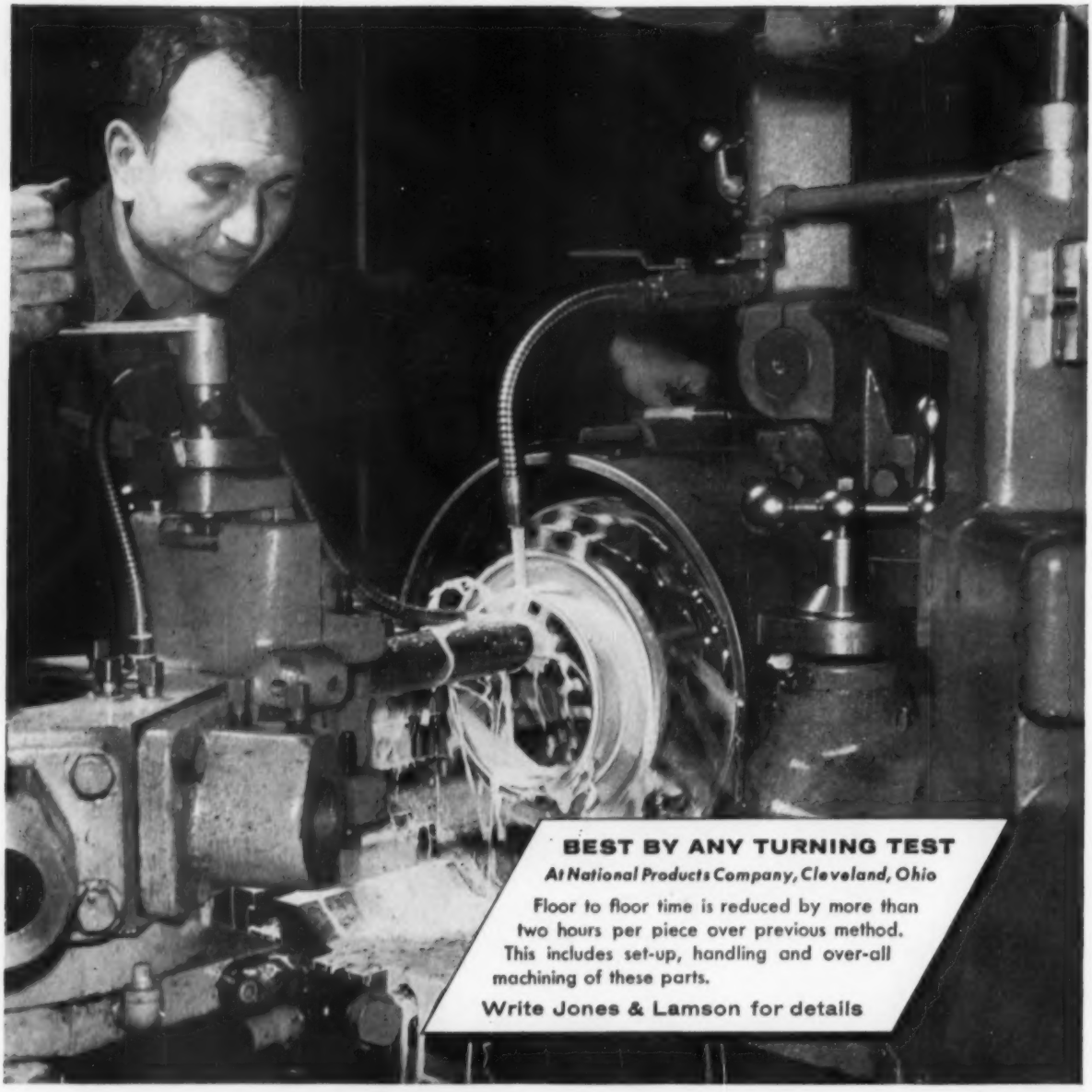
Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie, "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



MANUFACTURED BY W. H. NICHOLS COMPANY · WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS **THE ROBERT E. MORRIS COMPANY**

P.O. BOX #41
1 FARMINGTON AVE.
WEST HARTFORD 7, CONN.


BEST BY ANY TURNING TEST
At National Products Company, Cleveland, Ohio
Floor to floor time is reduced by more than two hours per piece over previous method. This includes set-up, handling and over-all machining of these parts.
Write Jones & Lamson for details

Jones & Lamson turret lathes are built and powered to produce *MORE CHIPS per tool*
MORE PIECES per hour
MORE PROFIT per job
than any other turret lathe of comparable size!

JONES & LAMSON

the man who needs a new machine tool is already paying for it

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.

EASIEST WAY TO GRIND SMALL PARTS TO "TENTHS"

the Brown & Sharpe No. 5 Plain Grinding Machine

Grinding the main bearing surfaces of sewing machine crankshafts . . . a routine job on the No. 5.

There is no easier, faster way to consistently grind small, duplicate cylindrical parts to 0.0001" or less, than on a Brown & Sharpe No. 5 Plain Grinding Machine (3" x 18"). It combines extra-convenient control with high-accuracy operation. For example: Operator can sit or stand comfortably, and easily handle *all* control and work . . . load, grind, and unload with the minimum of fatigue. Super-precision spindle construction minimizes spark-out time. Cross-feed handwheel automatically starts headstock and coolant when grinding wheel is advanced toward work, stops them when it is withdrawn — an extra aid to productivity. And, with optional Electralign Equipment, alignment control to 0.0001" on both straight and taper work is simple and positive. All the No. 5's machine movements are mechanical — simple, precise, troublefree. It's ideal for economical grinding of diameters up to 1", to close limits on a production basis. For full details, write Brown & Sharpe Mfg. Co., Providence, R. I.

Ask About Our Pay-As-You-Depreciate Machine Tool Plan

Brown & Sharpe *milling, grinding, and screw machines • cutters • machine tool accessories • precision tools • pumps*

Why the Die Designer Prefers PRODUCTO Die Sets

He can specify Producto with complete confidence

The die designer likes to specify Producto die sets on his blueprints because they are a nationally-accepted "brand." They're easy to get anywhere... and delivery is prompt.

He favors Producto because he knows he never has to compromise his die design. Even if the die layout is a little unusual, he will be able to select a die set to accommodate it from Producto's wide range of thicknesses and styles.

He also knows Producto has the equipment that can cut his tooling costs by letting him adapt his sets to a more economical *basic* design. Only Producto offers him complete foundry, pattern-making, welding and machining services for his special requirements.

The die designer recognizes Producto's Qwik-Fit Guide Pins as an important new feature that die makers want. He specifies them because they save up to 75% of the time normally required for die set assembly and disassembly.

The die designer likes to use Producto's new catalog, the industry's most practical tool. His die layout is simplified when he uses Producto die set templates. And Producto provides him with cost-saving ideas in the DIE SET DIGEST.

Most important, he can depend on *consistent* Producto die set accuracy to transfer from the drawing board to the press the precision and ingenuity of his die design.

Yes, the designer has found that Producto die sets justify his confidence in specifying Producto. You will, too.

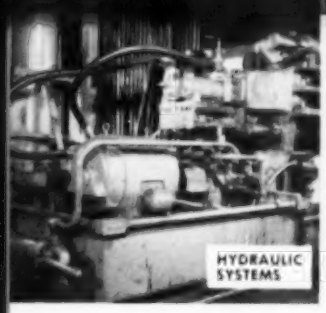
TWO FREE AIDS to more economical, efficient use of die sets are available from Producto. All-new CATALOG NO. 11 makes ordering and selection job easy. DIE SET DIGEST gives valuable tips for designers, builders and users of dies. Write for them today.

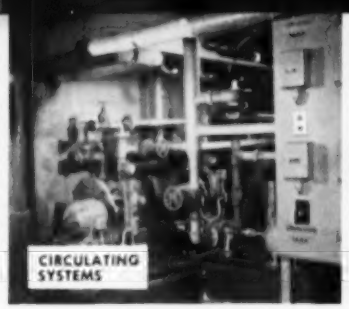
THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut

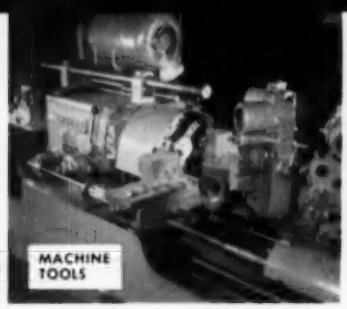
Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS



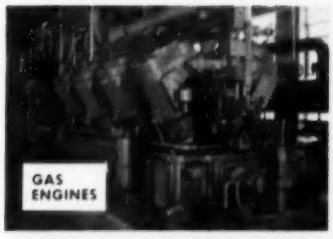


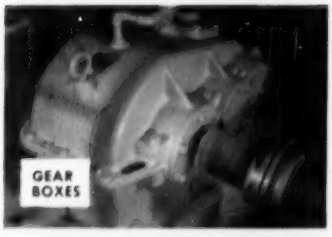


SUN SOLNUS OILS IDEAL LUBRICANTS FOR 80% OF ALL APPLICATIONS

Moderately priced...low in carbon-forming tendencies, Sun Solnus® oils simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several.* Their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price all add up to "more lubrication per dollar."

For technical information, see your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-51.





SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

© SUN OIL CO.

In Canada: SUN OIL COMPANY LIMITED, Toronto and Montreal

Valve on left is from compressor run for 3,000 hours with well-known, high-grade oil. At right is same valve after a 3,000-hour run with Sun Solnus oil. Note difference in carbon deposits.

3000-HOUR TEST PROVES SUN SOLNUS OILS REDUCE CARBON BUILD-UP IN COMPRESSORS

Equipment: A three-stage Norwalk horizontal-type compressor. Operating pressure: from 1,000 to 1,500 psi.

Test: The compressor was cleaned thoroughly and filled with a well-known, high-grade oil. The equipment was run for 3,000 hours, then torn down for inspection and cleaning. Then Solnus® 300 was tested in the same way.

Results: Look at the two pictures. You can see for yourself how Solnus oil reduced dangerous carbon build-up.

All types of reciprocating air compressors that have been changed over to a Sun Solnus oil show similar results. A test in your compressor will show the same remarkable reduction of carbon deposits.

You can get a technical bulletin about Sun Solnus oils by asking your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-52.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

© SUN OIL CO.

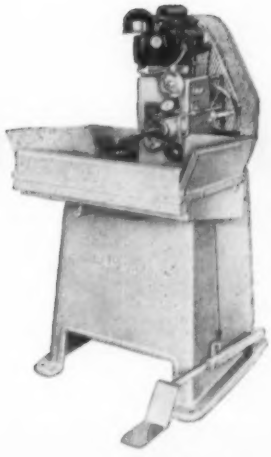
IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

SUNNEN HONING

Produces geometrically perfect holes free from chucking distortion—with production tolerances down to .0001", and precision limits down to .000025" if needed.

SUNNEN HONING

Corrects all hole errors:
OUT-OF-ROUND · TAPER · BELLMOUTH
WAVINESS · BARREL SHAPE · LOBING
TOOL CHATTER



SUNNEN HONING

Produces base metal surface finish as fine as 2 micro-inches RMS in hardened steel . . . free from smear metal, heat checks and chatter marks.

AVERAGE INSTALLATION: UNDER $1,000. DIA. RANGE: ⅛" TO 2⅛"

SUNNEN HONED HOLES FOR ALL-ROUND PRECISION

5
FREE BOOKLETS
They show how honing may solve your hole production problem.

TEAR OUT COUPON NOW

7099

SUNNEN
PRODUCTS COMPANY
7981 MANCHESTER AVE. • ST. LOUIS 17, MO.

☐ Send five free booklets.
☐ Have field engineer call for free demonstration.

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

are you running hard...

Conservative studies of growth potentials and long range trends, by both industry and government, show clearly that markets are already outrunning the labor supply for industrial production. The pace will get increasingly faster as our growing population demands more goods and services.

Those companies which stay in the race will do so by stepping up their productivity per man hour, and planning their capital expenditures accordingly. They will not stumble over the problem of machines displacing men, because they know there will not be enough labor to fill all the jobs created in the next ten years.

Avey production machines have already increased productivity per man hour, per square foot of plant space, and per dollar of invested capital in many plants. Their fast rate of return makes it profitable and pleasant to stay in the running.

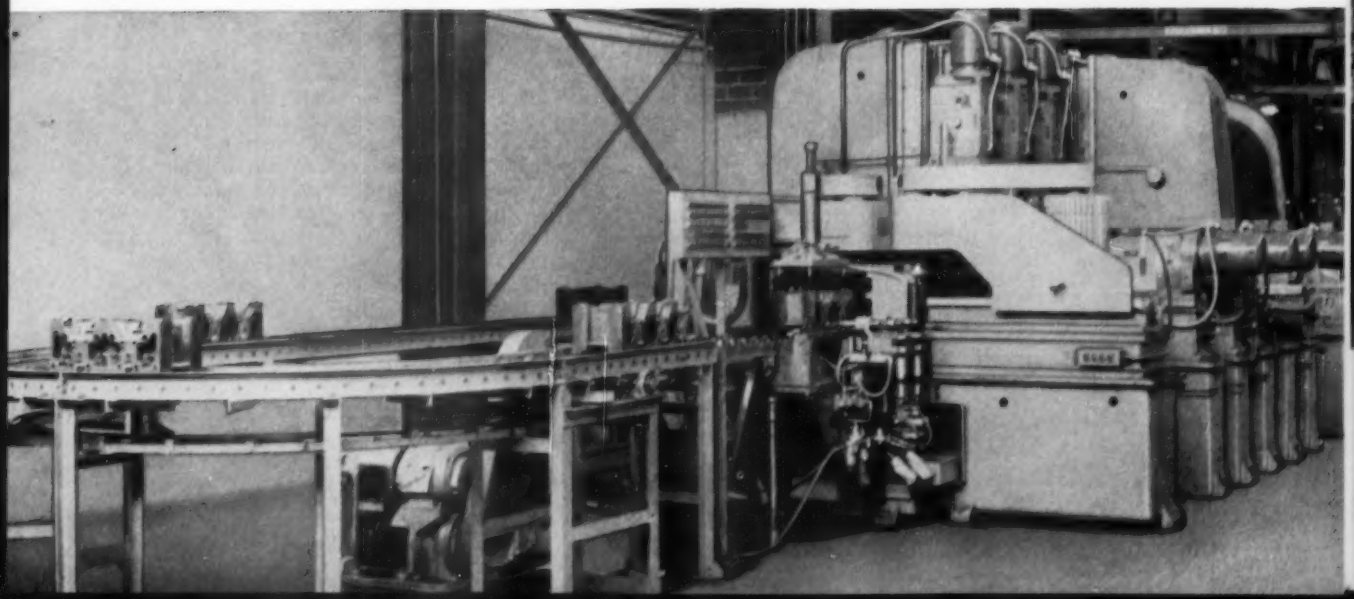
▸ **production data:** This machine automatically rough and finish mills, drills, countersinks, and taps 260 hydraulic pump covers per hour. Operations include automatic gauging, probing, and insertion of bronze bushing in bore.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

and losing ground?

Avey



NOW...YOUR SMALL SHEAR PROBLEM SOLVED!

ALL NEW Lodge & Shipley 24" speed shear

...GIVES POWER SHEARING AT PRODUCTION RATES AND LOWEST COST!

NEW SPEED, VERSATILITY AND CONVENIENCE FOR

- straight & angle shearing
- sequence shearing
- slitting • notching • blanking
- duplicating without dies

There's no need to tie up large shears or use makeshift methods for shearing small pieces. The all-new Lodge & Shipley 24" SPEED SHEAR is designed for fast, low-cost, accurate shearing operations.

Capacity . . . 1/8" in mild steel
Speed . . . 120 strokes/minute
Size . . . 72" high, 50" wide and deep
Throat Depth . . . 10-1/4"

Lodge & Shipley

For small shearing too . . .
your Lodge-ical choice!

The SPEED SHEAR can be used for straight shearing with the front adjusted back gauge. By using the large "End-Around" work table that is provided with numerous tapped holes, protractors, clamps and gauges can be quickly and accurately set up for duplicating or sequence shearing.

The 24" SPEED SHEAR is complete, ready to go to work anywhere in your plant. Ruggedly built of solid rolled steel plate, it is light in weight; floor loading is no problem. Ease of operation makes it ideal for women operators.

NEW LITERATURE AVAILABLE . . .
write today for Bulletin No. SS-24
Address: The Lodge & Shipley Co.,
3056 Colerain Ave., Cincinnati 25, Ohio.

BUTTERFIELD

100% inspected for
100% performance

- they cut clean
- live long
- finish smooth

Use Your Local Butterfield Distributor To Your Advantage.

You get lower inventory costs, expert counsel and "hurry-up" service.

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U.S.A.

You can acquire a new 4" Table Type machine for as little as $1.71 an hour, if you operate two 40-hour shifts, by using Gilbert's new financing plan: 6% simple interest (3% add on), up to 5 years to pay. (These prices are subject to change.) 5½" and 3½" Table Type machines cost even less to own.

new 4" and 5"

Every modern feature that can reduce floor-to-floor time is built into these new Gilbert 4" and 5" boring mills.

For one example, your operator can preselect speeds and feeds, and power automatic shifting takes over from there. For another, the pushbutton station makes his job easier and reduces his machine-handling time. This controls start, stop, and reverse for spindle; spindle electric clutch and brake; reverse for all feeds; forward, reverse power rapid traverse; spindle and milling feeds and rapid traverse; back gear clutch on spindle sleeve; milling feeds to head, table, and saddle (table type), or head and column (floor type); spindle feed electric clutch; power clamp, head to column (table type) or to head and base-to-runway (floor type); and automatic positioning, if ordered.

The built-in reversible motor (up to 20 hp) on the head puts maximum power to the tool; there are no long drive shafts. Speeds up to 1,500 rpm are standard.

The Cincinnati Gilbert Machine Tool Co.
3366 Beekman Street, Cincinnati 23, Ohio

those who buy
GILBERT
buy Gilbert again

boring mills

HARDINGE
ELMIRA, N.Y.

High Speed Precision
MILLING MACHINES

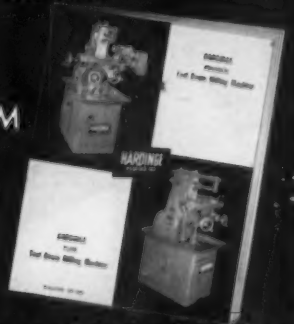
The RIGHT Size For Work Which is *Too Small for Heavy Duty Millers.*

Advantages

- Saves Production Time
- Higher Speeds
- Lower Power Consumption
- Less Investment
- Saves Floor Space

1 1/16" Cutter Spindle Capacity
with 5C Round Hardinge Collet
Eight Spindle Speeds —
110 to 1850 R.P.M.

Write for Bulletin TM-UM

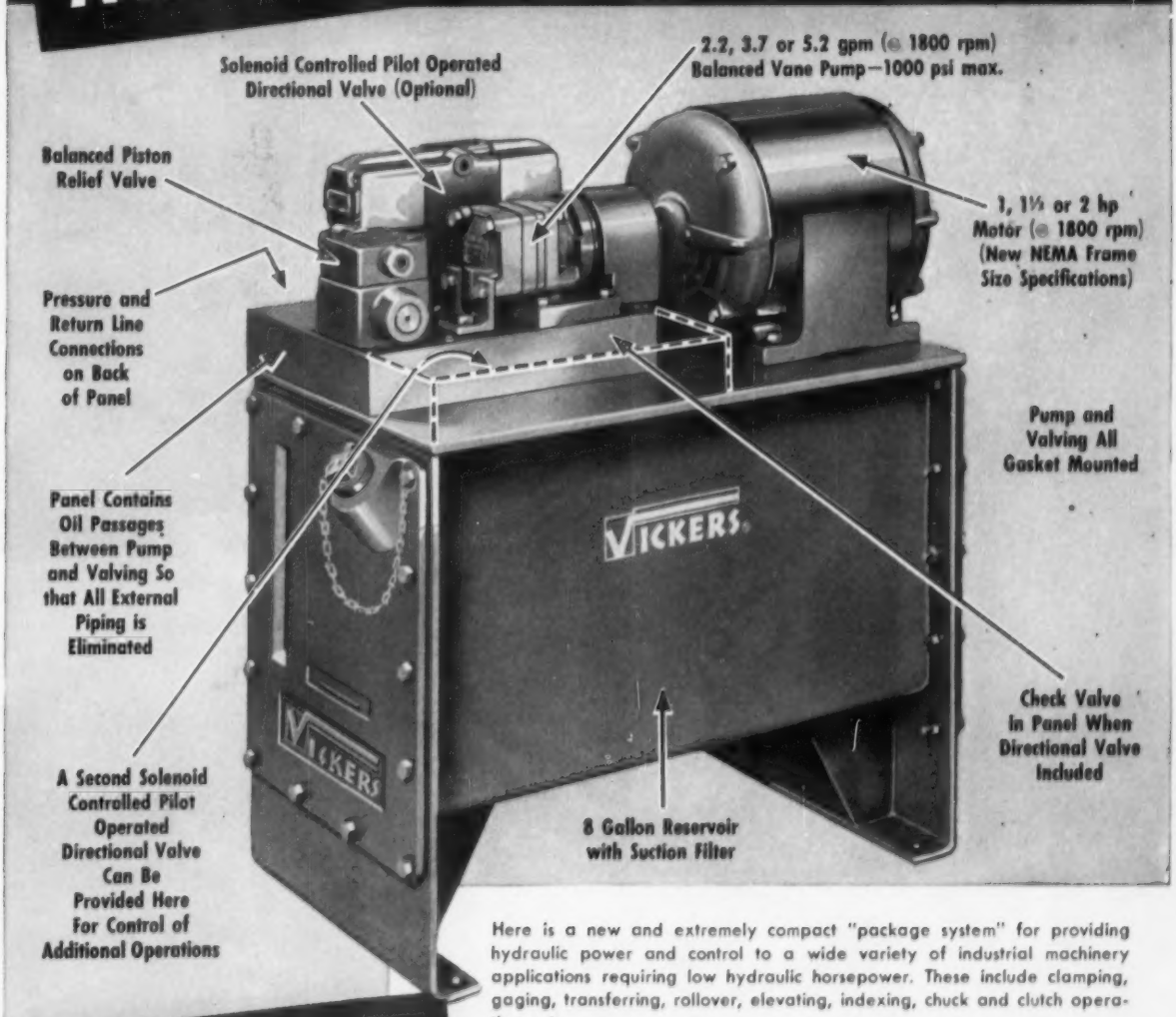


Model UM Universal Spiral Miller
Model TM Universal Plain Miller

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

A NEW IDEA... in hydraulic power and control systems


Solenoid Controlled Pilot Operated Directional Valve (Optional)
2.2, 3.7 or 5.2 gpm (@ 1800 rpm) Balanced Vane Pump—1000 psi max.
Balanced Piston Relief Valve
1, 1½ or 2 hp Motor (@ 1800 rpm) (New NEMA Frame Size Specifications)
Pressure and Return Line Connections on Back of Panel
Pump and Valving All Gasket Mounted
Panel Contains Oil Passages Between Pump and Valving So that All External Piping is Eliminated
Check Valve in Panel When Directional Valve Included
A Second Solenoid Controlled Pilot Operated Directional Valve Can Be Provided Here For Control of Additional Operations
8 Gallon Reservoir with Suction Filter
VICKERS

VICKERS Series T8 HYDRAULIC PIPELESS POWER PACKAGE*

Here is a new and extremely compact "package system" for providing hydraulic power and control to a wide variety of industrial machinery applications requiring low hydraulic horsepower. These include clamping, gaging, transferring, rollover, elevating, indexing, chuck and clutch operations, etc.

Note the many features indicated on the photograph above. The result is improved and simplified hydraulic design . . . also reduced installation and maintenance costs. This "package system" has great flexibility . . . is available in a wide variety of combinations of standard components assembled to suit individual requirements. Pretested and ready for immediate operation, it has also the advantage of undivided Vickers responsibility. For further information, ask for installation drawings 178706-8.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
ADMINISTRATIVE and ENGINEERING CENTER
DEPARTMENT 1410 • DETROIT, 32, MICH.

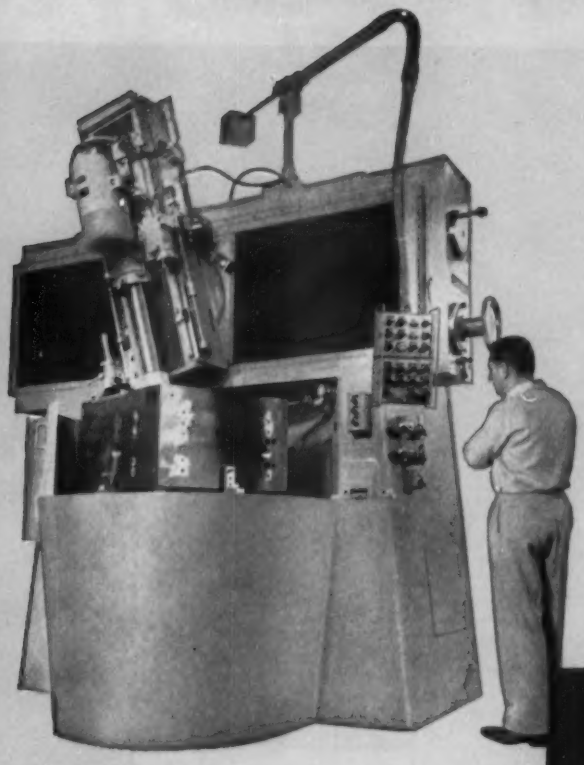
Application Engineering Offices: • ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • HOUSTON • LOS ANGELES AREA (El Segundo) MINNEAPOLIS • NEW YORK AREA (Summit, N.J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WASHINGTON • WORCESTER

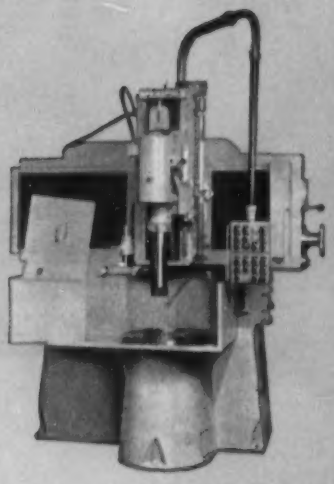
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

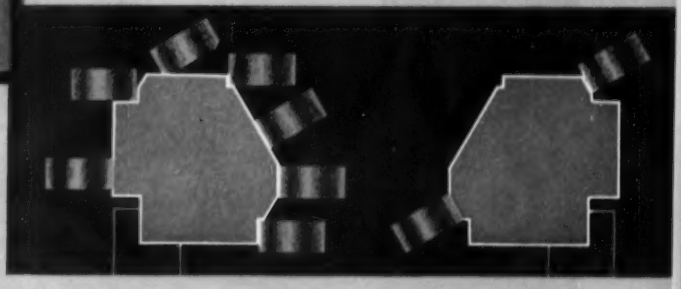
7311

*These "package systems" supplement the Vickers line of standard hydraulic power units.

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921







one setup: nine jobs

As flexible, as responsive as a dentist's drill, a Springfield Vertical Universal Grinder can reach around and into a workpiece to do nine different jobs on one chucking.

If you make a pipeline valve, a mold, a bearing race—requiring micro-inch finish on any or all the faces shown in the diagram—at whatever angle—look into Springfield. These grinders cut down the number of set-ups, frequently eliminate hand-lapping, operate with fewer work-holding devices. And, as a bonus, on jobs calling for extreme concentricity, one angle setting of the Springfield head grinds both faces of mating parts.

All three models readily adaptable to special problems.

Vertical Universal Grinders: swings 18″, 24″ and 42″.

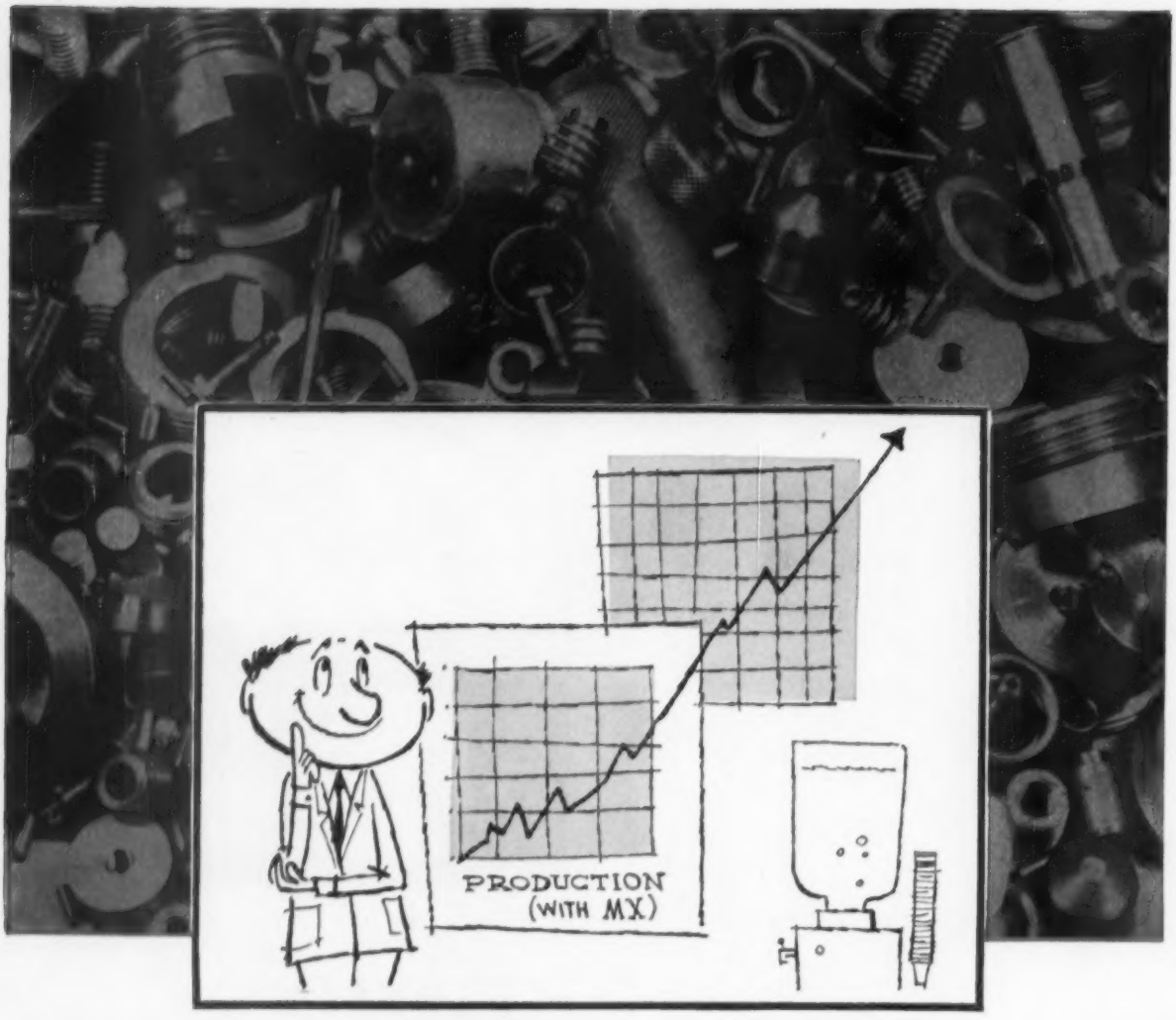
Lathes: Engine and tool room, contouring and reproducing—swings 14″ to 32″.

The Springfield Machine Tool Company

Springfield, Ohio

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD



PLEASANT THINGS HAPPEN when you put USS Free-Machining MX Steel to work. You'll find that you can use cutting speeds as much as 50% greater than the speeds at which regular Bessemer grades are normally run. Your production will increase from 10 to 50%. Tools will last up to twice as long. Part finish will be better. And you'll have fewer rejects.

What's more, USS MX has so consistently outperformed ordinary screw stock that we can promise you with complete confidence that *MX will cut the cost of any part* you now machine from regular Bessemer grades. It's been proved in hundreds of shops.

And here's another reason why MX is your best buy today. USS Free-Machining MX has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today . . . yet it costs no more than ordinary screw stock.

Switch to MX. Produced in all the popular screw stock sizes, this production-boosting, cost-reducing steel is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trademark. In hot-rolled form, MX is available direct through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output . . . longer tool life . . . lower costs

USS

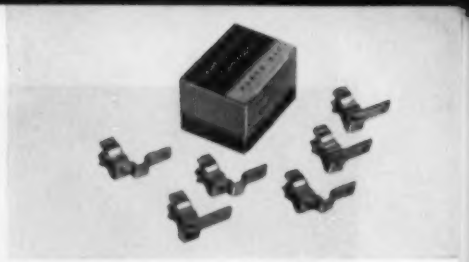
—when you do the job with free-machining

MX

UNITED STATES STEEL

How you profit by using . . .

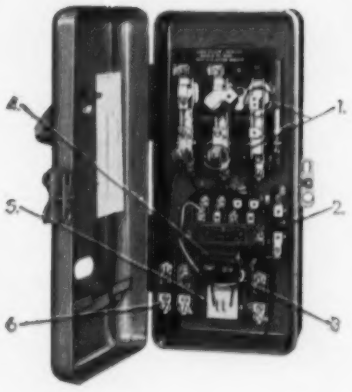
6 KITS TO MODIFY GENERAL ELECTRIC MAGNETIC STARTERS

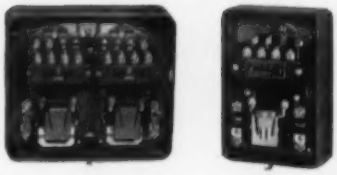


1. **FUSE CLIPS** can be easily changed on all G-E combination starters for use with different line current ratings or voltages.

2. **AUXILIARY INTERLOCKS** can add up to four additional control circuits to provide maximum flexibility for magnetic starters.

3. **PUSH BUTTON** for START-STOP operation can be mounted through knockout provided in the cover of G-E magnetic starters.





4. **SELECTOR SWITCH** fits into same cover knockout as the pushbutton unit, and gives you a choice of ON, OFF, or AUTO. setting.

5. **STRONGBOX COIL** can be changed quickly and easily for different voltage ratings. There is no need to disturb power wiring.

6. **3RD OVERLOAD RELAY** can be added, whenever needed, to G-E magnetic starters. A screwdriver is the only tool necessary.

KITS PERMIT ON-THE-SPOT MODIFICATION OF G-E STARTERS

These six modification kits modify any G-E across-the-line non-reversing, combination, or reversing starter. This means that your distributor can give you off-the-shelf delivery of all these forms.

If you now stock modified starters, these kits—plus standard starters—will permit you to cut inventories of "specials" and still have the starters you need. All modifications can be made quickly, and a screwdriver is the only tool needed.

Send in the coupon below for a new bulletin, complete with ordering data and "how-to-do-it" pictures of each kit. Your nearest General Electric Distributor will be glad to give you additional information.

Advertising and Sales Promotion Section H733-17
General Electric Company
Bloomington, Illinois

Please send me a free copy of MODIFICATION KITS FOR MAGNETIC STARTERS GEA-6481

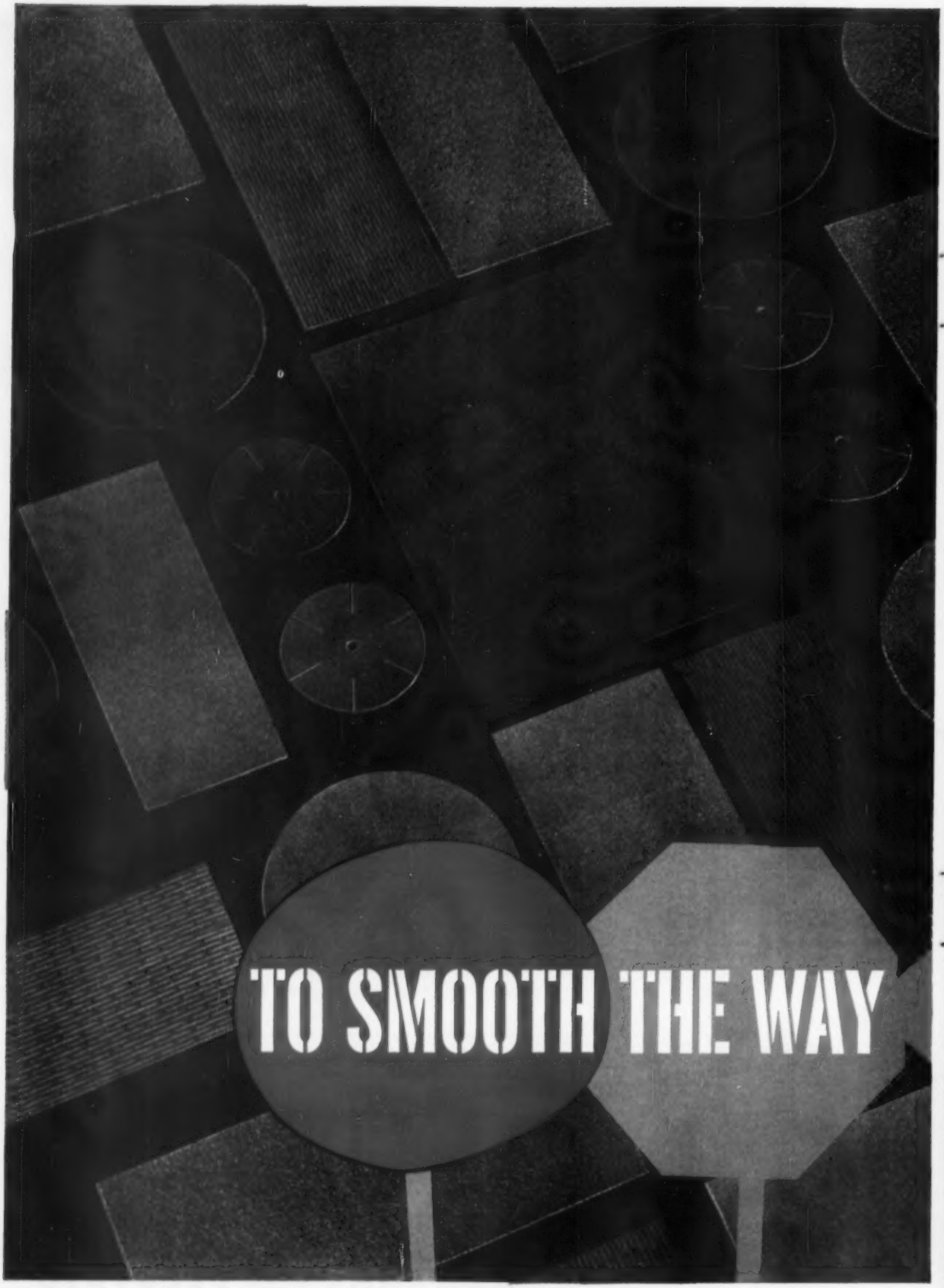
NAME .....

COMPANY .....

ADDRESS .....

CITY ..... **STATE** .....

GENERAL ELECTRIC


TO SMOOTH THE WAY

JEWEL BRAND ABRASIVES IN SHEETS

JEWEL BRAND Coated Abrasives are stocked in a wide range of standard size sheets. Large inventories of semi-finished materials are maintained from which special sizes may be produced at short notice. Sheets are available in paper backings of A, C, D, and E weights; in cloth backings of jeans or drills; in JEWELITE waterproof paper; and in closed or open coatings. All shipments made in "MASTERPAK" Cartons, a protective type of carton originated by ABRASIVE PRODUCTS, INC.

A COMPLETE LINE OF COATED ABRASIVES

Abrasive Products, Inc., manufactures a complete line of JEWEL BRAND coated abrasive products — belts, rolls, sheets, discs, and specialties in a wide variety of shapes and sizes. It has branch offices and warehouses in New York, Chicago, Cleveland, Pittsburgh, St. Louis, Detroit, High Point, Los Angeles, and Portland, Oregon, to back up distributor and factory service.

"MASTERPAK" CARTON FOR PROTECTION

This AP development set the pace for all packaging of coated abrasives throughout industry. It protects shipments in transit by keeping out moisture and other damaging elements — also provides reinforced corners and edges to avoid crushing contents. In the "MASTERPAK" carton JEWEL BRAND abrasives reach you in prime condition, ready to use and the "MASTERPAK" keeps them fresh and clean until the last sheet is gone.

JEWEL BRAND SERVICE

JEWEL BRAND Distributors are located at key industrial centers throughout the country. Backed by AP warehouse service and specialized engineering experience, they are equipped to meet individual needs promptly and efficiently. JEWEL BRAND Distributors and AP Salesmen have one important objective in common — to provide customers with not only the precise coated abrasive for the job, but service "in a class by itself".

JEWEL BRAND

JEWEL ABRASIVES

COATED ABRASIVES

JEWELITE • JEWELOX • JEWEL GARNET • NEW PROCESS • JEWEL EMERY • PILGRIM FLINT

"We have no operating problems

Midwest Metal Stamping reports results of 8 years of press operation using STANOIL

In 1948, Midwest Metal Stamping Company, Kellogg, Iowa, put into service a Bliss Hydro Dynamic Press. STANOIL Industrial Oil was selected as the hydraulic medium. The initial fill was 1,400 gallons. The press operated continuously from 1948 until Christmas, 1954, when it was shut down five days for overhaul.

Stamping being removed from press by operator George Johnson. Press has used STANOIL Industrial Oil as hydraulic medium for eight years. Oil has perfect performance record.

At the time of overhaul, the STANOIL Industrial Oil was drained. And here STANOIL's superior demulsibility was demonstrated. Due to the high rate of condensation, two barrels of water were removed from oil reservoir. An oil analysis in the Standard Oil laboratory proved the oil still suitable for continued service. After filtration, it was returned to the reservoir and the press put back in operation. STANOIL continues to deliver the same perfect performance for Midwest as before.

STANOIL Industrial Oil can perform just as efficiently for you. Find out. There is a Standard Oil industrial lubrication specialist near you in any one of the Midwest and Rocky Mountain states. Call him. Or write Standard Oil Company, 910 South Michigan Ave., Chicago 80, Illinois.

when we use STANOIL Industrial Oil"

Don Foster, Midwest Stamping Purchasing Agent and Jesse Nelson (right), Standard Oil industrial lubrication specialist, display metal blank and finished tub turned out on Bliss press. Technical service on lubrication problems is Jesse Nelson's job. He's been doing such work for seven years. Jesse has an engineering degree from the University of Iowa and is a graduate of the Standard Oil Sales Engineering School. Customers find this experience and training pay off *for them.*

Quick facts about ***STANOIL*** *Industrial Oil*

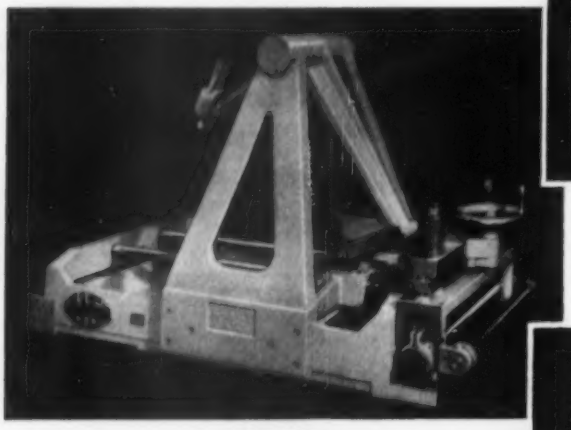
- **Special refining and an additive, exclusive with STANOIL, make this industrial oil resistant to chemical change.**
- **In all grades of STANOIL that need it, an advanced type corrosion inhibitor is added. Inhibitor "plates out" on metal surfaces, prevents rust.**
- **Selective refining and special additives give STANOIL low pour point. STANOIL flows freely at low temperatures.**
- **High viscosity index of STANOIL is indication of the oil's ability to resist change at any operating temperature.**
- **No foam, no emulsion with STANOIL. STANOIL's special additive and selective refining minimize or eliminate these oil problems.**
- **Low carbon forming tendencies of STANOIL reduce or eliminate this problem.**

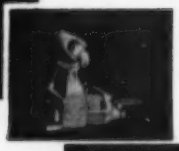
STANDARD

STANDARD OIL COMPANY
(Indiana)

UNCOVER THE HIDDEN PROFITS IN YOUR PRESS ROOM!

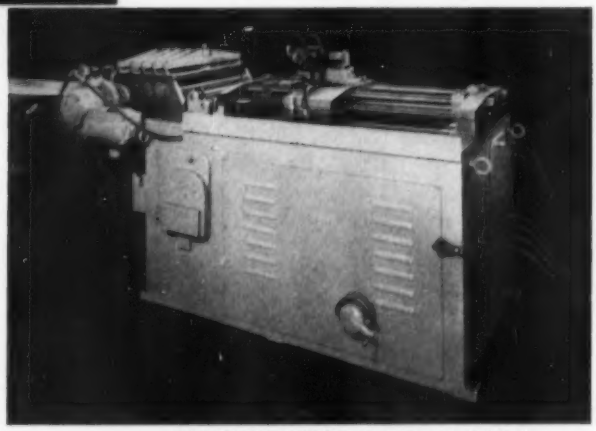
U.S. Slide Feed, Plain Straightener, and U.S. Multi-Roll Cradle used in conjunction with conventional O.B.I. Press.





Smallest and largest sizes of U.S. Slide Feeds which we now build. To the left, Model SF-24-24 capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches. To the right, Model SF-00 capable of handling material up to 1½ inches in width with feed length adjustable up to a maximum of 1 inch.

WITH U.S. AUTOMATIC PRESS ROOM EQUIPMENT



SFC-24-24 U.S. Cabinet Mounted Individually Motor Driven Slide Feed capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches at one stroke. Equipped with Stock Straightener with a pair of Motor Driven take-in rolls suitable for material up to .060 in thickness. This feed can be cycled to obtain feed lengths over 24 inches.

By converting your presses into automatic machines you are able to reduce piece part costs. You, like all other manufacturers, are interested in attaining this end result. The units illustrated are only a few of the different types of Feeds, Straighteners, Coil Cradles and Stock Reels included in our line. These and our other units have been designed and built with the end result of "Automatic Operation" in mind.

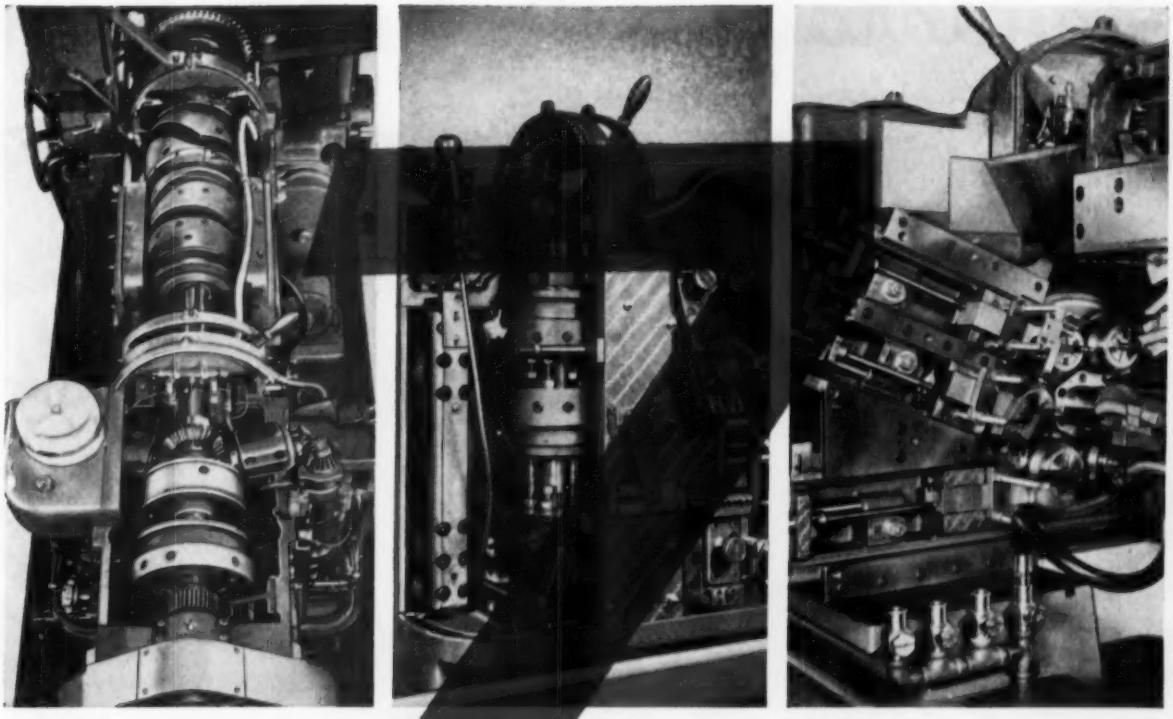
The use of this equipment gives you the double advantage of increased production and reduced labor costs, plus the feature of flexibility. Within their capacity, U. S. Slide Feeds can be easily adapted to handle materials varying in width, thickness and length of feed. Furthermore, U. S. Slide Feeds are designed so that the length of feed is controlled between positive stops providing consistent accuracy that is especially desirable in progressive die operations.

If you use presses in your production program be sure to write for a copy of our Bulletins No. 80-A and 90-A illustrating and describing U. S. Automatic Press Room Equipment.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

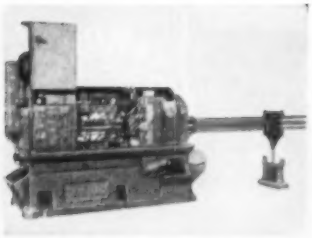


Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the 9/16", 1", 1⅝" Sixes, and the 2⅝", 3½", 5", and 5¼" Fours.

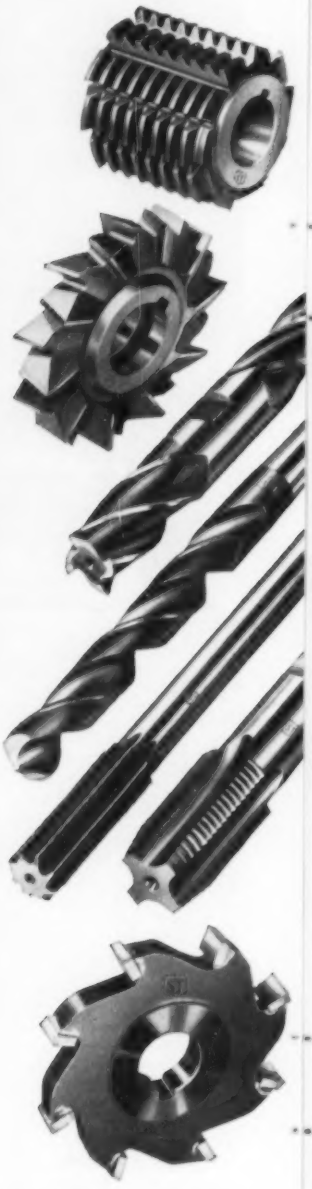
These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

Standardize with STANDARD



● For three quarters of a century, the **STANDARD TOOL MAN** has been serving Industry . . . making sound, profitable recommendations to improve metal-cutting methods.

The Standard Tool Man is a specialist in all types of metal-cutting operations. His services are yours without obligation.

Call him!

YOUR STANDARD TOOL DISTRIBUTOR STOCKS THE COMPLETE LINE

SERVING INDUSTRY 75 YEARS 1861 1936

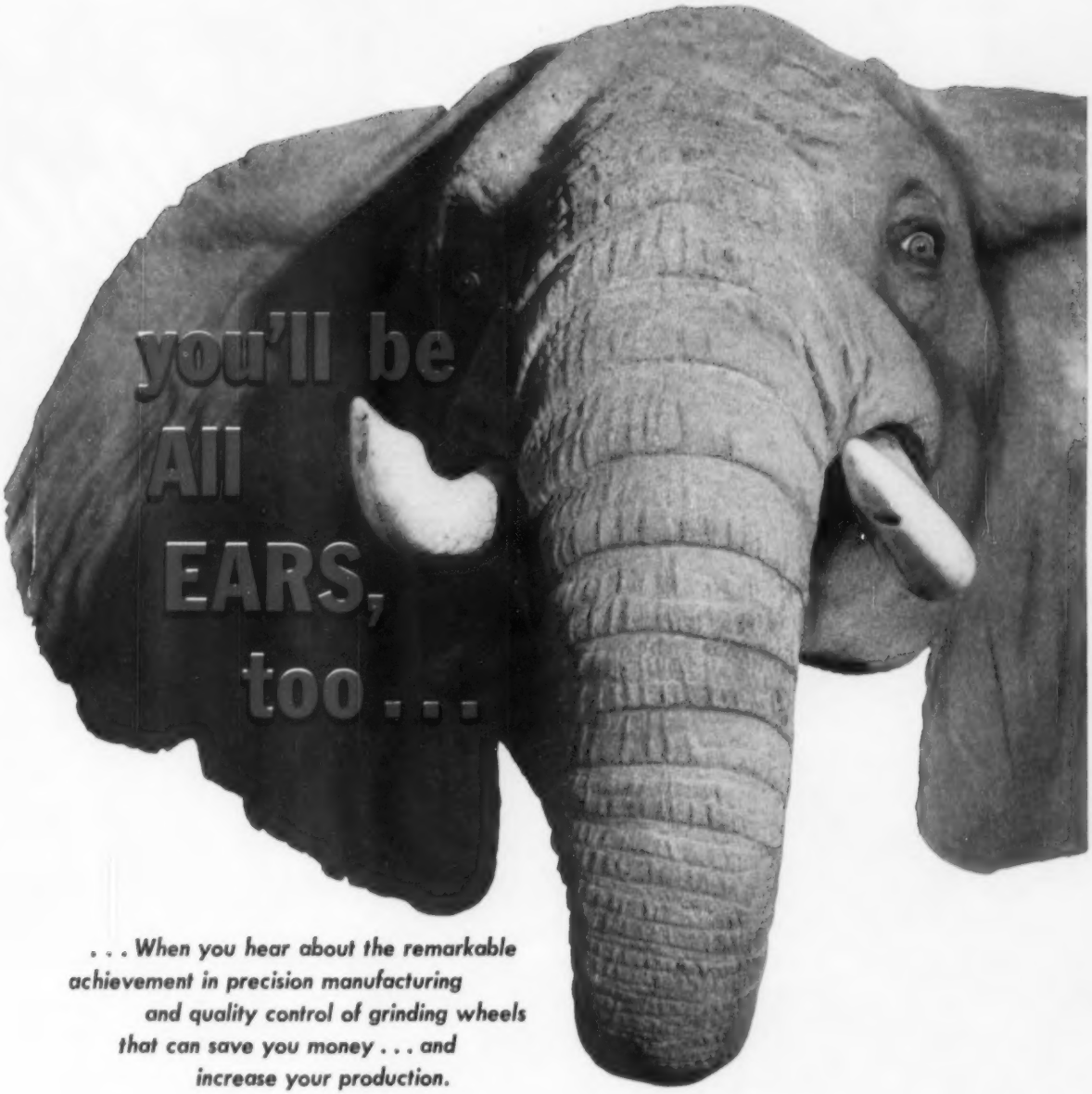
STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

STANDARD TOOL CO.

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Carbide-Tipped Tools · Gages*



. . . When you hear about the remarkable achievement in precision manufacturing and quality control of grinding wheels that can save you money . . . and increase your production.

It's POSITIVE DUPLICATION— offered *only* by CINCINNATI (PD)° Grinding Wheels.

Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

So, if you don't have an elephant's memory, make a pencil note to contact your CINCINNATI Grinding Wheels distributor. Or, contact us direct and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

And don't forget this—*only* CINCINNATI Grinding Wheels give you . . .

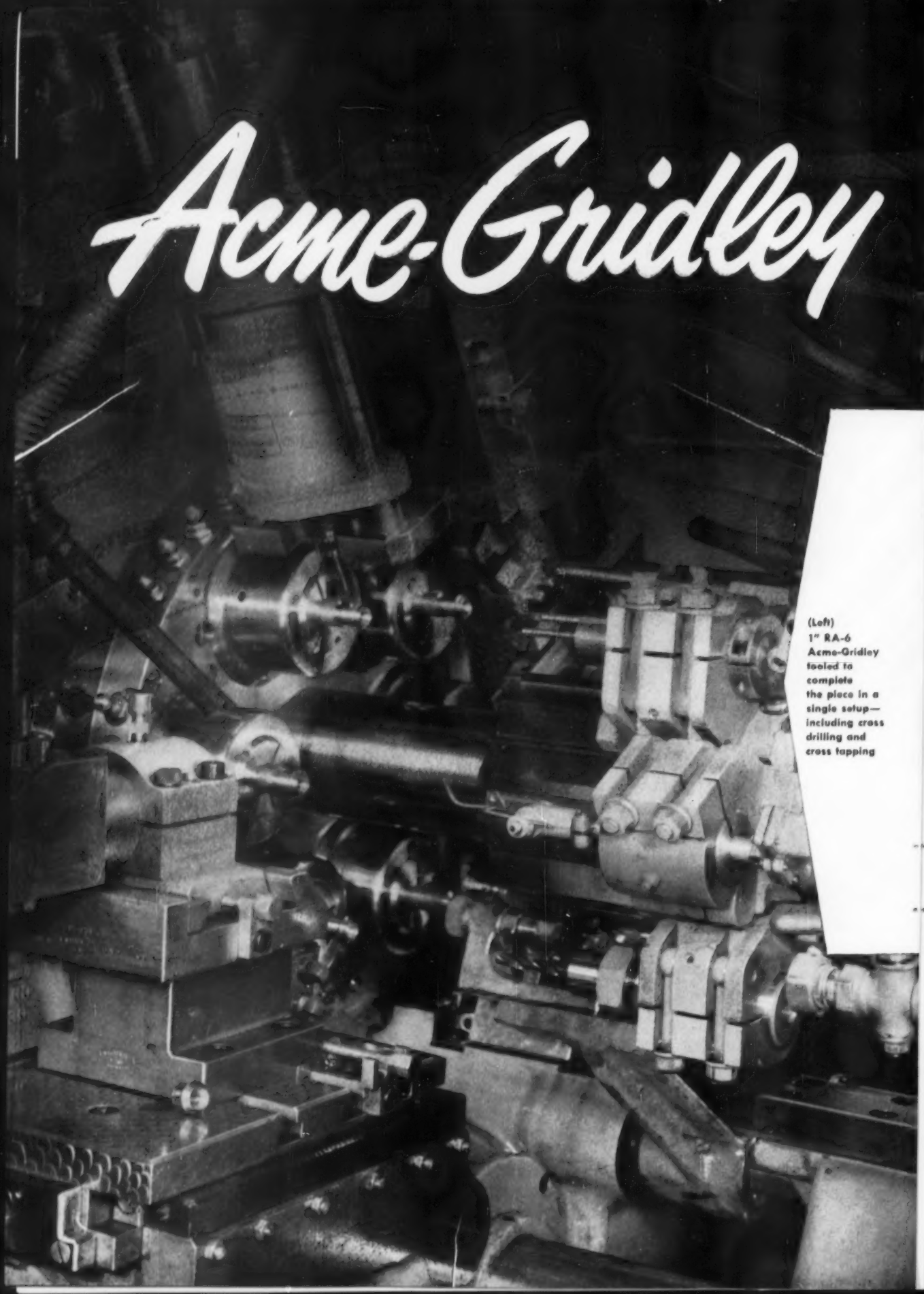
(PD) POSITIVE DUPLICATION

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U.S. Pat. Off.

CINCINNATI°
Grinding Wheels

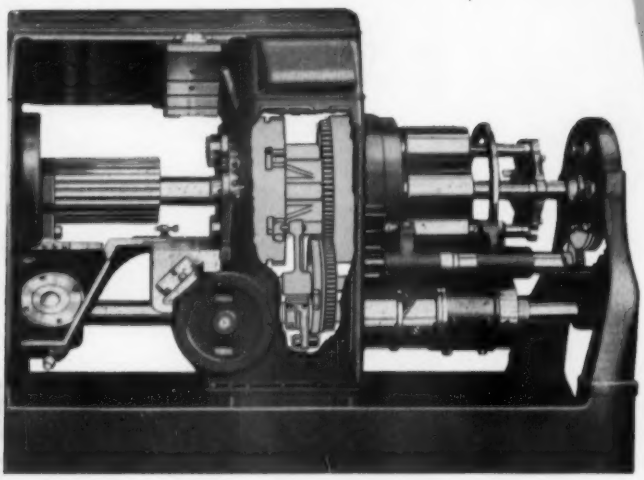
Acme-Gridley



(Left)
1" RA-6
Acme-Gridley
tooled to
complete
the piece in a
single setup—
including cross
drilling and
cross tapping

shockless indexing combined with independently-powered stock reel..

gives greater sustained accuracy...longer machine life



SHOCKLESS, POSITIVE INDEXING of the spindle carrier at high speed is accomplished by a Geneva mechanism. Indexing starts smoothly from a standstill, rapidly accelerates, then decelerates and comes to a dead stop without shock. Accurate location and positive locking of the carrier is assured by the locking pin mechanism.

STOCK REEL IS INDEPENDENTLY POWER INDEXED through a separate shaft and gear. This eliminates torsional strain and any tendency to whipping action, which might cause excessive wear on spindles and spindle carrier.

Acme-Gridleys are at their productive best when performing "secondary" operations during the primary setup—operations which otherwise would require additional time, machine investment, and floor space.

On an Acme-Gridley you can perform operations that require "on-the-button" indexing—such as cross-drilling and cross-tapping in successive spindle positions—with the same fourth-decimal-point-accuracy at the end of the shift as at the start.

And—your Acme-Gridley has power and stamina to spare, at the highest speeds and feeds that modern cutting tools can safely stand.

LET US TELL YOU MORE ABOUT Acme-Gridley BASIC DESIGN

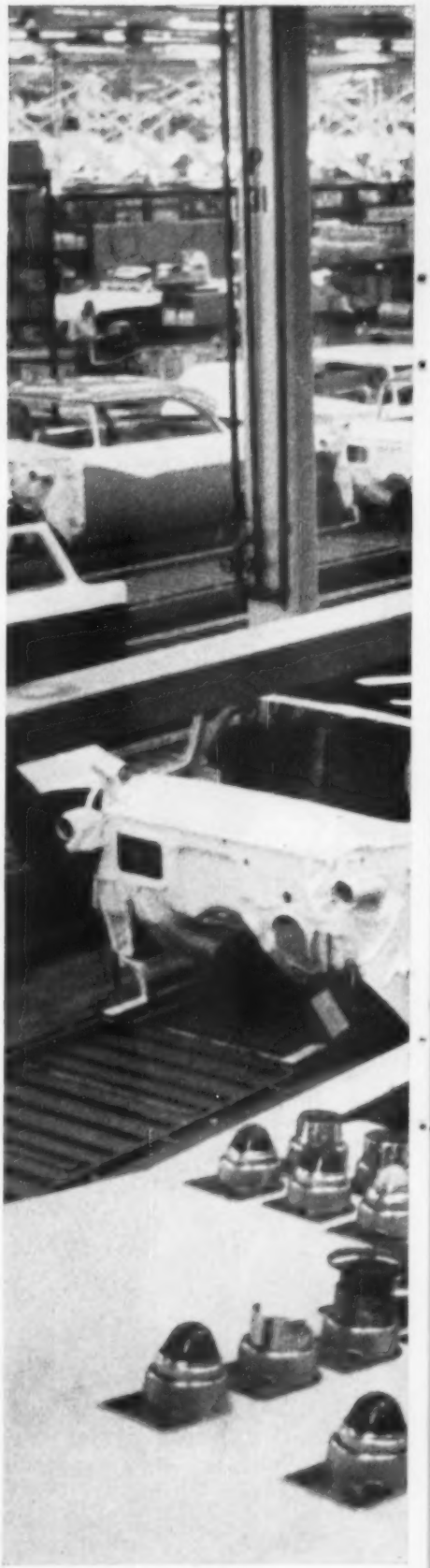
This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

THE NATIONAL ACME COMPANY • 171 EAST 131ST STREET • CLEVELAND 8, OHIO

SALES OFFICES: • Newark 2, New Jersey • Chicago 6, Illinois • Detroit 27, Michigan

Keeping production on the move with Westinghouse pushbuttons



On Ford assembly lines, automation starts with the press of a button. From the paint line (shown), 18 different body styles are automatically guided to various trim lines. As each body passes the operator, he channels it to the proper trim line simply by pressing a button.

In textile mills, steel, paper or fabricating plants, Westinghouse pushbuttons are also on the job, guiding smooth-functioning lines of material to finished product stages. Doing it faster, better, and at a lower operating cost to you than ever before possible.

From Westinghouse you can get precisely the right operator, enclosure, whatever you need—when you need it. Complete lines of standard-duty, heavy-duty, and Oil-Tite* pushbuttons are stock items with Westinghouse.

Write to Westinghouse, Box 868, Pittsburgh 30, Pa., or see your nearby Westinghouse distributor for a copy of the new *Pushbutton Guide*, B-6749.

*Trade-Mark
J-30229

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

NOW L&I introduces

Highest Precision

DRILL & REAMER BLANKS

LAVALLEE & IDE, INC.

LAVALLEE & IDE, INC.

AVAILABLE FROM STOCK

Drill Blanks
up to ½" +.0000", −.0003"
over ½" +.0000", −.0005"

Reamer Blanks
up to ½" +.0002", −.0000"
over ½" +.0005", −.0000"

- Fractional Sizes 1/16" thru 1"
- Wire Gage Sizes #1 thru #80
- Letter Sizes A thru Z
- Complete Sets

Any size from .0135" thru 1.0000"!

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, N Y 36, N Y

No Problems

In reference to the item concerning our plant (*AM*—Aug 27 '56, p137) which states in part, "straddles the boundaries of Berkeley, Oakland, and Emeryville, Calif, runs afoul of three different building codes and tax structures," we would like to point out that this is incorrect.

There are no problems in location or in reference to building codes and tax structures. That we have building permits from three different cities to build our plant is unique, it is true, but this has not posed problems.

J W Lewellen, adv mgr,
Marchant Calculators Inc
Oakland, Calif

More About "Building Block" Machine Tools

May I comment on your article about Ford's concept of "building block machine tools," (*AM*—July 16, '54, p113)?

We, as manufacturers of multiple-function cutting tools, have felt that one of the best ways to reduce the tremendous cost of transfer machines has been overlooked. *Prior to* automation it was common practice to employ multiple-function tools for the combining of operations. *With the advent of* automation and the transfer machine, there has been a definite trend toward having each station perform only one cutting operation.

For example, just a short while ago, we were called in by Ford process engineers for consultation on a subland drill that was going to be used on a transfer machine they were buying. During this discussion we noted that the machine layout called for separate heads for drilling and chamfering holes prior to tapping. Such a simple operation as this could have been done easily with 16 spindles and 16 subland drill-chamfer tools. These tools would have cost approximately $6.00 each. Instead they chose to have 16 extra stations for these chamfering operations. These additional heads were going to cost approximately $10,000 each, not counting the fact that they would take up valuable

SHOPMATES

N. Jarvis

I GOT THIS PART ALL DONE ··· IT WASN'T EASY ·· NOW THAT LITTLE GROOVE ·· VERY DIFFICULT ··· AND THOSE THREADS AIN'T STANDARD ··· NOW THERE'S A LITTLE TOOL MARK HERE ·· WON'T HURT NOTHIN' -- WILL IT ?
UH HUH! UH HUH! MMMMP! S'POSE SO! HUH UH! NYUPP!
THE WHIP AIN'T GIVIN' HIM ANY OF THE ANSWERS HE'S AFTER ··· HE WANTS THAT PIECE OKAYED SO HE CAN'T BE BLAMED LATER ON.
THERE'LL BE SOME BLAME COMIN' TOO ··· THAT THING LOOKS LIKE IT WAS WHITTLED WITH AN AXE!
N. JARVIS

BLISS HIGH PRODUCTION PRESSES "do-it-themselves" at Black and Decker

Just three Bliss High Production Presses produce the millions of motor laminations Black and Decker uses in its complete line of more than 150 portable power tools!

Running in the upper speed range, sometimes at well above 250 strokes per minute, through two shifts a day—and occasionally three. And they've been doing it for a long time now with no problems.

Of course, H-P presses are built for speed. Extra heavy cast Meehanite frame • *Square* gibbing • Automatic lubrication • Variable speed drive • Special air friction clutch • Counterbalanced crankshaft. Every feature has been especially designed to maintain precision at top speeds. That adds up to top production rates, longer die life.

Another plus, users tell us, is the wide open die area that makes quick set-up and changeover possible. In fact, the fast set-up makes *short-run* work practical with Bliss H-P Presses. And the room *under* the press is a handy place to run chutes or store tote boxes.

If production of short-stroke stamped parts is your problem, long run or short, you'll want to learn more about Bliss H-P presses. Our recently revised 32-page catalog No. 27-C describes the entire line and gives examples of the wide range of work you can accomplish with these presses. Why not write for a copy today.

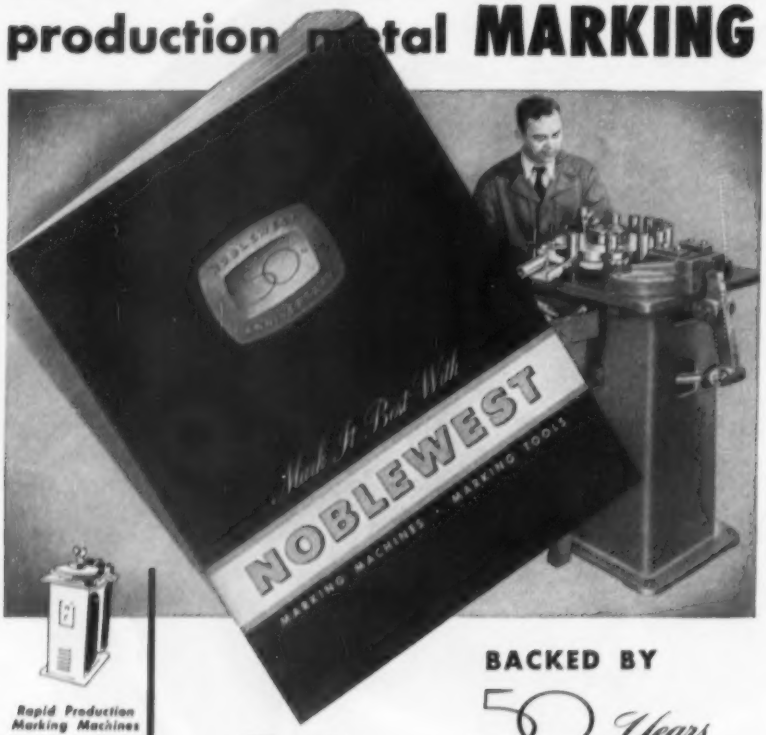
BLISS
SINCE 1857

is more than a name... it's a guarantee

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, California; Branch Offices in Boston, Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. Other representatives throughout the world.

E. W. BLISS COMPANY, CANTON, OHIO • Presses, Rolling Mills, Rolls, Special Machinery

NEW GUIDE to modern production metal MARKING



Rapid Production Marking Machines

General Purpose Marking Machines

Precision Marking Dies

Automatic Numbering Heads

BACKED BY

50 Years

Experience

AS MASTERS OF METAL MARKING

For half a century NOBLEWEST has been solving industry's marking problems . . . designing and building equipment for faster, better, *permanent* marking of metal products at lower cost. NOBLEWEST is the originator of the *Roll-Marking Process* and many other innovations in rapid production metal marking. In this, our 50th year, we derive great satisfaction from the knowledge that more and more leaders of industry continue to bring their marking problems to NOBLEWEST.

May we send you a copy of our new catalog containing the complete NOBLEWEST line of MARKING MACHINES and MARKING TOOLS? Just send us your name and title on your company letterhead.

MARK IT BEST WITH

NOBLEWEST

Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

floorspace and have to be serviced and maintained. For $160,000.00 they certainly could buy and service a lot of subland drills for a great number of years.

Most of the process engineers agreed that it would be far more economical and efficient to use multiple-function tools and eliminate these additional stations. However, it appeared that it was management's policy to use single-purpose tools for each station.

It is our contention that this reasoning is one of the prime factors contributing to the tremendous costs facing the industry today. Whenever we have approached the large producers and the machine tool industry, the following reasons for this attitude have been advanced:

1. Automobile companies stated that they would rather put their dollars into additional heads, on the basis that they would be justified costwise, because of the long life of the machine tool involved. —As you state in your article, Ford in particular, now admits that they are facing more frequent changes than originally anticipated. Thus, by changing their mind they have answered themselves. Certainly from the "building-block" standpoint, if they used multiple-function tools, it would be less difficult and expensive to change around fewer stations or heads.

2. The initial cost of this equipment is so great that no risk can be taken with any cutting operation. Once the machine is built, additions are practically impossible and the cost of secondary operation is prohibitive.—Our contention is that there are many instances where applications of special multiple-function tools are completely *safe, practical* and *economical*. If the numerous special cutting-tool shops in this country had not been able to justify their existence on a cost basis alone, they wouldn't be here today. Our industry has been practically ignored in the design and sequence selection of transfer-type equipment. Most of us have been designing and making these multiple-operation tools for many years, and we are competent to state where they should and should not be applied.

3. The use of single-purpose standard tooling for each cutting operation makes the procurement of these tools easier than the procurement of special cutting tools. —This thinking is a throw back to

the past. Many special tools are now available on a delivery basis very close to that of standard tools. We, for instance, can supply a completely special subland drill with a maximum delivery of 10 days. This is accomplished by stocking partially completed blanks and having only to finish grind to our customers' specifications. Other companies are now doing the same thing.

4. The impression held by some companies that special cutting tools are prohibitive in cost and maintenance.—Often the cheapest tool is not the best tool to buy.

The correct method is to determine the cost per hole through the examination of initial cost, maintainence and pieces per grind. If these plants would investigate on the above basis, they could easily justify the cost of special tools.

5. One of the major objections advanced to us is the difficulties encountered in regrinding multiple-function tools.—This can easily be remedied by the addition of inexpensive equipment and almost any sort of employee educational program.

We hope that we do not appear to be completely prejudiced. There is some merit in many of the arguments advanced to us. We merely feel that some consideration should be given our point of view. Further, we cannot speak for the entire cutting tool industry. However, we are sure you will find many companies sharing our opinions.

William Hofbauer, *Vice President & General Manager*
Mohawk Tools, Inc,
Montepelier, Ohio

The Schools Agree

Our machine-shop teacher, Mr James Anderson, called my attention to your recent editorial (*AM* —Sept 24 '56, p115).

Thank you for your keen analysis of the present status of shop courses in terms of the public's attitude towards them. This attitude, I fear, is shared by many educators. The assist from industry is a powerful one; I speak from years of knowledge of the work of New York City's Advisory Board for Vocational Education. Articles like yours will do much to encourage local interest in vocational high schools.

Mildred C Pascale, principal,
Queens Vocational High School
Long Island City, N Y

REED

Thread Rolling Attachments

Provide Versatile Tooling for Threading Applications at

MUELLER BRASS CO., Port Huron, Michigan

Stronger, smoother threads with less burrs . . . substantial material savings . . . and increased production of approximately 30% . . . are among the many advantages proved by actual quality control records at Mueller Brass Co. after installing REED thread rolling attachments.

Typical Parts Rolled at MUELLER BRASS CO.

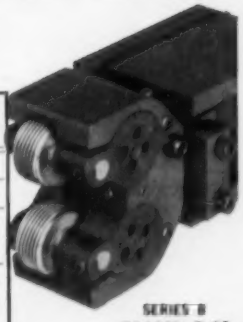
5/16" - 2" Straight Thread Diameters
1/8" - 2 1/2" Taper Thread Diameters
NPT and NPTF (Dryseal)
150 Different Threading Applications
16 Thread Rolling Attachments
4 Different Types of Automatic Screw Machines
ACME-GRIDLEY • GREENLEE
DAVENPORT • NEW BRITAIN

REED THREAD ROLLING ATTACHMENTS are made in FOUR STANDARD SIZES

Model No.	Complete Diameter Range	*Pipe Threads That May Be Rolled	Approximate Number of Common Screw Threads That May Be Rolled
B 10	0 - 5/8"	7	80
B 13	1/8" - 13/16"	9	90
B 18	1/4" - 1 1/8"	15	105
B 36	3/8" - 2 1/4"	18	185

*Straight and Taper Pipe Threads, including Dryseal (NPTF). Change may be made from Straight to Taper Threading by changing rolls only. No other equipment is necessary.

ATTACHMENTS DESIGNED FOR SPECIAL APPLICATIONS



SERIES B GEARED TYPE

Write for Attachment Bulletin B-1

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

4 WAYS TO IMPROVE YOUR GAGING PROGRAM

1. CUT MAINTENANCE. With fewer parts and interchangeable gear assemblies in No. 25, No. 655 and No. 656 sizes, Starrett Dial Indicators cut maintenance costs. You keep more indicators in service longer with fewer spare parts to stock. The entire gear assembly can be removed as a unit for convenience in servicing.

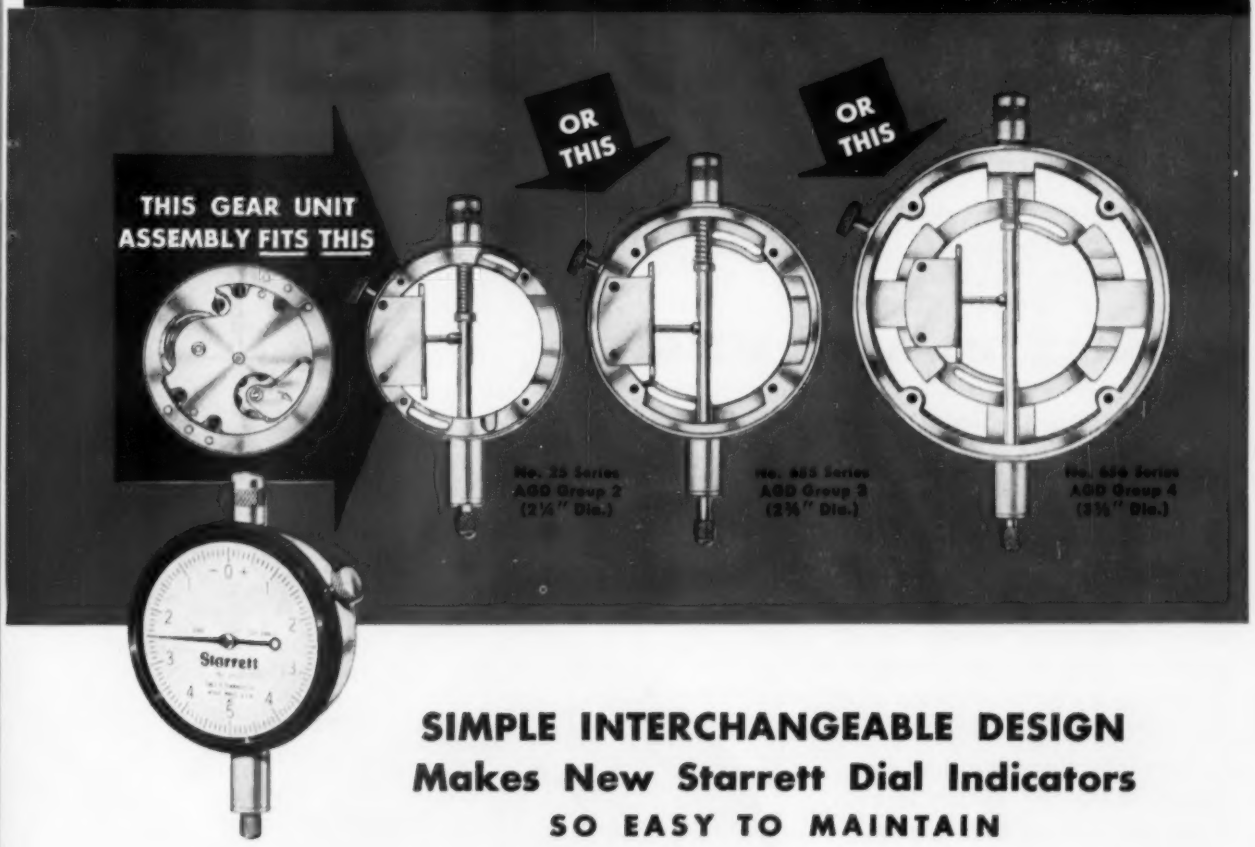
2. IMPROVE ACCURACY. Simplified design with rugged, rigid construction means Starrett Dial Indicators are less subject to friction and wear. Replaceable low friction jeweled or inserted bronze bearings align accurately to eliminate end play. Rustproof stainless steel gears and tempered pinions, stainless and tempered racks and spindles and heavier bridge and case, all make for lasting accuracy.

3. INCREASE EFFICIENCY. New easy-reading dials, satin chrome exterior finish and contrasting black bezels help operators read faster and more accurately with less eye fatigue. Count hands on long range models read directly in decimals . . . no calculations.

4. IMPROVE PERFORMANCE. Direct acting springs completely around the spindle or rack eliminate cocking and side friction. Action is smoother, more accurate, with less contact pressure. And with the new Nonshock mechanism to stop shock *before* it reaches the gear train, Starrett indicators stand up longer even on brutal gaging applications.

WHEN YOU MEAN PRECISION YOU SAY STARRETT

WITH NEW Starrett HIGH PRECISION LOW FRICTION (Patented) Dial Indicators


THIS GEAR UNIT ASSEMBLY FITS THIS
OR THIS
OR THIS
No. 25 Series AGD Group 2 (2½" Dia.)
No. 655 Series AGD Group 2 (2½" Dia.)
No. 656 Series AGD Group 4 (3½" Dia.)
Starrett

SIMPLE INTERCHANGEABLE DESIGN Makes New Starrett Dial Indicators SO EASY TO MAINTAIN

If you use dial indicators — particularly if you maintain your own repair service — think what this exclusive Starrett feature means to you. Simple Interchangeable Construction means fewer parts to stock, less maintenance time and lower upkeep cost *plus* longer, more accurate life for all your dial indicators.

The entire gear assembly is identical and interchangeable in all comparable models of Starrett No. 25, No. 655 and No. 656 regular and Nonshock indicators. With only two different gear unit assemblies, and by merely changing the combination of gears, 105 different models can be made up with regular mechanism. By changing the case assembly to spindle and rack sleeve, most models can be converted to *Nonshock*.

Simple Interchangeable Construction also means fewer parts and these are heavier and more rigid. Rugged, rigid, simplified design means Starrett Dial Indicators are subject to far less friction and have a longer, more accurate life.

SEND THIS COUPON for catalog describing the complete line of Starrett High Precision-Low Friction Dial Indicators.

Starrett

SINCE 1880 — WORLD'S GREATEST TOOLMAKERS

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

The L. S. STARRETT COMPANY, Dept. C
Athol, Massachusetts

Please send information on Starrett *High Precision-Low Friction* Dial Indicators.

Name.....Title.....
Company.....
Street and Number.....
City.....Zone....State.....

You get what you want with

DANLY

PRESSES

PLANT PLANNERS

Get Better Production Balance, Easier Automation, Faster Installation

New Danly presses stand up to full capacity operation, single shift or around-the-clock, with minimum down-time . . . you get the performance you plan on. No more "production pile-up" with presses producing at less than full capacity or shut down entirely. Controls are "built-in" for convenient floor level adjustment, ideal for automation, designed for maximum safety.

Each press is delivered pre-tested and ready to go . . . saving weeks of costly erection time.

Phone or write for complete catalog information. Get the whole story and see for yourself.

DANLY MACHINE SPECIALTIES, INC.
2100 S. Laramie Ave., Chicago 50, Ill.

DANLY

Spot news...

- **All 15 of Ford's assembly plants are working 30% overtime**—highest peacetime employment rate in company history. Reason: they're saying that the '57 Ford has the greatest introductory success since the model A, and the Ford has $1 billion orders to fill before January 1.
- **Foreign steel has been delivered to Chicago by Italian freighter.** Steel from Europe will continue to come into US as long as plate and structural steel are in short supply. Import tonnage, however, is small.
- **Assembly of British machine tools in Israel has begun** as result of agreement between B Elliott & Co Ltd and Hamat Co of Holon near Tel-Aviv. Automatic lathes and grinders are involved, with Elliott supplying the parts from London. The motors are built in Israel.
- **Survey of all the steel in place in the US** as of January 1, 1956, and how much of it will go into scrap this year, is being made by Business and Defense Services Administration, Department of Commerce. Purpose is to see whether there is justification for curtailing export of steel scrap.
- **Special course in ceramic and other new cutting tools** is being offered by Chicago's non-profit Industrial Engineering College to management men, cost estimators and senior industrial engineers. First five-week course started October 30. It's held mornings.
- **Ford will spend at least $125 million on new machines and tooling** in the next 2-3 years. That represents more than half of $250 million borrowed just recently on 4% unsecured promissory notes.
- **Machine tool production is scheduled for the biggest increase of all** products in China's second Five-Year Plan to run from 1958 to 1962. Adoption of the techniques of automation is included in the plans of the Chinese Communist Party.
- **Delay in arrival of parts** is setting at least one auto introduction date back two weeks. Suppliers say it's the automakers' own fault, that they delayed too long in placing orders for this year's models.
- **They're having trouble hiring department store Santa Claus's in Cleveland.** Reason: this month alone, 9000 new jobs have opened up in that city—6700 of them in metalworking. That leaves only 25 per 1000 jobless.
- **One Russian plant is said to be producing 15,000 semi-automatic lathes** a year, compared with total U S production of about 1000 such lathes a year, according to American Standards Association president H T Hallowell, Jr, who says rigidly enforced standards are the reason.
- **Glass dispersions that protect steel and titanium during hot working** have been developed by Acheson Colloids Ltd, London. They can be applied to the metal by dip, brush or spray after the metal has been degreased. Can be air-dried or baked.
- **Czechs and East Germans now have an agreement** whereby the Czechs build only trucks of 3.5 metric tons or better, the Germans only smaller ones.
- **Gage that immediately tells OD of machine components** to an accuracy of 0.00001 in. has been developed by England's Southern Instruments Ltd.

Spot index to major News stories...

Guided Missiles—What's In It for Metalworking? 170
Standards Can Cut Plane Prices 175
Numerical Control Gains Acceptance 176
Computer Is Heart of New Transformer Plant 177
Czechs Bid for No. 4 Spot in World Tool Market 178
Foreign Report 178
Names in the News 180
Washington 99
Detroit 101
Machine Tools 103
What's Ahead
in Metalworking 115
in Business 116

EX-CELL-O BUSHINGS LAST TWICE AS LONG

Customer's test proves there IS a difference in bushings

Recently one of the world's largest manufacturers of heavy equipment proved beyond doubt Ex-Cell-O Bushings last twice as long as the other bushings tested. That's good news for all users of bushings! After drilling 16,300 holes, leading bushing brands were measured. Wear on other makes of bushings averaged .0039"—ready for scrap—but wear in Ex-Cell-O Bushings averaged only .0017".

The reasons for this outstanding showing: (1) Ex-Cell-O Bushings are made of high chrome, high carbon oil-hardening bearing steel, (2) automatic atmosphere-controlled heat treating for uniform hardness, (3) precision grinding inside and out, (4) head type bushings and liners are ground under the head for perfect seating.

These bushings take the toughest production runs in stride. Make your own test—see and compare Ex-Cell-O.

Call your Ex-Cell-O Representative or write Ex-Cell-O, Detroit, for the high quality bushings used by major companies all over the world. You'll get "same day" shipment.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION

XLO

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington ... NEWS REPORT

Government spending on the rise . . .

Government spending seems certain to go up about $3 billion in fiscal 1958—and much of the boost will be in capital goods for defense and public works.

That's the outlook as next year's federal budget shapes up now. The expenditure hike is likely to be matched—and may be exceeded—by a boost in tax revenues stemming from the business boom. So the outlook is for another budget surplus and another cut in the public debt. But so far experts doubt that the surplus will be big enough to prompt general tax cuts.

The election outcome is not expected to bring any fundamental changes in the Budget now being readied for the fiscal year that begins next July 1.

Biggest chunk of the budget hike will go for defense. Defense Secretary Wilson says the increase will be between $1.5 billion and $2.2 billion over the current $36.1-billion rate of Pentagon expenditures. But Defense Dept officials hint that service chiefs seek increases closer to $3.5 billion, which Wilson himself is presumably slashing.

One reason for the defense increase is the general price rise—in materials, equipment, construction, labor. Since two-thirds of military procurement is under cost reimbursable or price redetermination contracts, the general industrial price hikes are eventually reflected in shipments of military goods. Still more important as a factor, though, is the higher cost of the new generation of weapons—missiles, A-powered subs, supersonic planes, electronic fire-controls, and the like. A Pentagon estimate is that the new arms cost from two to three times as much as the equipment being replaced.

Another big boost is due in construction of public works. Outlays for the new Highway Program alone will go to nearly $500 million. Requests for schools, dams, and slum-clearance will push up construction plans another $1 billion. The big question is whether Congress will go along with a big School Aid Plan. Also to be increased is the Electric Power Reactor Program—by about $200 million or twice current construction.

Tax outlook . . .

President Eisenhower is already backing one type of tax cut for next year: a $600-million reduction in corporate taxes by dropping the rate on the first $25,000 of profits from 30% to 20%. The idea is to help smaller firms. But the administration is warning the country not to expect a general tax cut next year unless economic conditions change markedly. The Eisenhower administration would support a general cut only if business were to soften materially. But if the boom continues—as most Washington experts now figure—the administration will stick by its policy of this year, unless the fiscal '58 surplus winds up much greater than expected.

Faster writeoffs on used tools . . .

Prospects are bright that the administration will go along with a proposal that the 1954 Internal Revenue Code's accelerated depreciation formulas be extended to cover purchases of up to $50,000 worth of used industrial equipment. The proposal was made by the Cabinet Committee on Small Business headed by Arthur F Burns, Chairman of the Council of Economic Advisers, as a means of aiding small firms. The 1954 law, which offers several accelerated methods of computing depreciation deductions, applies only to new equipment.

Up to now, trade associations of used equipment dealers have unsuccessfully tried to have the accelerated depreciation allowances extended to include their machines. In recent months, however, small business lobbyists have also taken up the cudgels. The administration is now trying to deflate Democratic claims that Ike has forgotten the small businessman, is strongly hinting that the Burns Committee's proposals will be accepted. But it's noteworthy that Treasury Secretary Humphrey, Ike's top tax official who in the past has been conservative on new tax benefits, is one of the Cabinet officers not included in the Burns Committee's membership.

Build-up of super-tanker fleet . . .

Plans for a government-stimulated buildup of a super-tanker fleet are in the works. Behind them is Washington's desire to shake loose from dependence on Suez to haul Middle East oil, and the general need to add more tankers to the fleet. Even without the Suez crisis, industry figures the growing demand for oil will require the present world fleet to be doubled within the next decade. It would take 600 super-tankers of 60,000 deadweight tons to double present tonnage; U.S. share would be 40%, according to present ratios.

BAY STATE

PRECISION PERFORMANCE...

To this skilled artisan, precision performance means duplicating in miniature the graceful lines of a former romance-laden queen of the seas.
To tap users, precision performance means production-line continuity, better threaded parts, increased tap life . . . and BAY STATE!

BAY STATE TAPS

Bay State Tap & Die Company

Mansfield, Massachusetts

On the shelves of your local Industrial Supply Distributor

Detroit ... NEWS REPORT

High hopes for aluminum . . .

Already established in the 1957 models as a decorative item, aluminum is well on its way toward replacing steel in many sections of the car body.

Up to now, aluminum's advantages have always been looked upon as technical rather than economic, Dr George Perkins of Reynolds Metals told the recent annual convention of the American Society of Body Engineers. But now aluminum can gain a price advantage over other metals if the auto industry will just realize that you can't use procedures and tooling primarily intended for steel fabrication.

Probably the first big swing toward use of aluminum in cars will be for bumpers. Auto engineers and designers freely admit that aluminum is getting more and more popular because of the critical shortage of nickel, and because aluminum can be anodized to produce colored bumpers that match or complement auto paint jobs.

Steel men, naturally, don't agree that aluminum makes the best bumpers. They look for stainless to become the No. 1 bumper material. To this end, Sharon Steel Co is setting up new facilities in Detroit that will increase the availability of stainless for bumpers by 25%.

Bumpers are only a preliminary goal of the aluminum people, of course. They talk about using the metal in door panels, and as fenders, trunk lids and hoods.

They also point out that the brake problem—critical in some of the new 14-in.-wheel models—could be greatly eased by using lightweight metals. And, they say, with aluminum a whole fender section could be formed in a single stamping operation with trim strips, ribs, emblems and lettering all done at once.

And just to show they're thinking along the same lines, the makers of auto glass at the same Body Engineers' convention envisioned for the near future a car without any steel above the belt line at all—just a big glass bubble.

Price troubles at Ford . . .

Those newspaper stories to the effect that Ford had cut its auto prices didn't tell the whole story—not quite.

Ford spokesmen, who said they were cutting prices to meet Chevrolet competition, first took care to reduce the dealer's discount from 25 to 24%. The dealers in the Detroit area are said to have responded by agreeing in a closed session to tack on a $100 price pack to all Fords. Biggest question has yet to be answered by Ford—what prompted the dealers' discount cut anyway?

A growing tide of rumor is beginning to flow out of the Giant of Dearborn—with some pretty evident street signs:

Ford's earnings for the first nine months are pegged at $145 million—down a long way from last year's same-period earnings of $312 million. Henry Ford II attributes the cutback to (1) lesser earnings, and (2) "heavy abnormal costs."

It's the latter that's inspiring the rumors. Word around the Motor City is that at least one Ford VP (who's also a group supervisor) will resign within weeks—and that others in the manufacturing and metals end will either follow suit or be transferred.

Inside word is that the '57 Ford cost a lot more to produce than Ford had anticipated—and when that happens in Detroit heads fall.

When the shuffling is all over, it might well be that the organization will find a spot for the youngest Ford, Bill, who hasn't had an official job since the Continental Mark II was jerked out from under him and put with Lincoln.

Chrysler's wildcat strikes . . .

AS WE GO TO PRESS, the wildcatters, who swore up and down "We'll never go back until we get what we want" ended the strike in just four days. Why? Other UAW locals put the pressure on them, saying, in effect "Look, you're killing us—you're throwing everybody else out of work around here along with you. Let's cut it out, boys, and get back to work." Here's the background on the strike:

As we predicted in this column several weeks back, Chrysler had been forced to halt all new model assembly because of wildcat strikes that had thrown 35,000 out of work. Consequently, Plymouth, Chrysler's big pitch for a bigger share of the '57 market, will be in short supply on its introduction date—very short supply.

The reason for all the strikes? Chrysler has put the squeeze on its workers for more productivity.

As one Chrysler man puts it, "All we want our people to do is to turn out as much work as a guy in Ford or GM turns out on the same job. They won't do it. They strike. And this year, of all years, we can't afford a strike—even for 2 or 3 days."

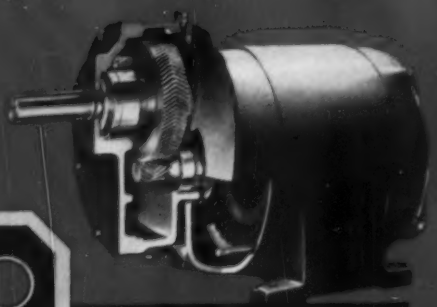
UAW's Local 869 seemingly was behind the strike all by itself, with the UAW International making strenuous efforts to get the men back on the job unsuccessfully. Consequently, Chrysler nearly called in the NLRB to stop the local from "violating its sworn agreement with the company to bargain collectively."

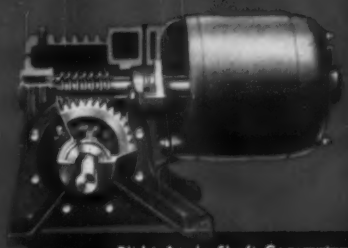
Write your own ticket—

MASTER
ALTERNATING CURRENT MOTOR

SERIAL	✔		STYLE	✔	
TYPE	✔	FRAME ✔		H.P.	✔
VOLTS	✔		CYCLES	✔	
AMPS.	✔		PHASE	✔	
R.P.M.	✔		SERVICE FACTOR	✔	
CODE	✔	TEMP. RATING ✔			
(SA)	✔				

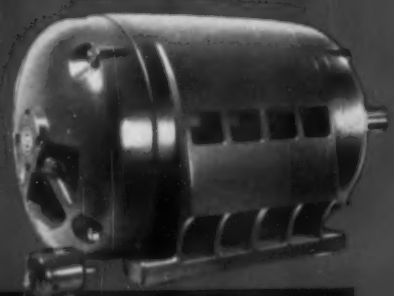
MANUFACTURED BY
THE MASTER ELECTRIC CO., DAYTON, O., U.S.A.
62916 PATENTS PENDING


Parallel Shaft Gearmotors


Right-Angle Shaft Gearmotors

Unibrake Motors

Speedrangers


Standard Motors— ⅛ to 400 H.P.

What are your power drive requirements? Here at Master, with the widest selection in the nation to choose from, you're sure to fill your needs quickest and best.

Need something special in gear reduction—electric brakes—variable speed operation—fluid drive or special mounting? Or would some of our standard models (⅛ to 400 H.P.) fill the bill? You'll find the answer here! And remember, all Master components are engineered to form combinations of units in one streamlined, compact package of efficiency. Name your need and the name that fills it is Master—for greater salability of motor driven products; for increased productivity of plant equipment.

Motor Ratings..⅛ to 400 H.P. All phases, voltages and frequencies.

Motor Types.....Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.

Construction ....Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.

Speeds .....Single speed, multi-speed, and variable speed.

Installation .....Horizontal or vertical, with or without flanges and other features.

Power Drive Features .....Electric brakes (2 types)— 5 types of gear reduction up to 432 to 1 ratio. Mechanically and electronically-controlled variable speed units—fluid drives—every type of mounting.

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO

Machine tools ... NEWS REPORT

So far, so good . . .

Though September fell $8 million short of August in net new orders for machine tools, the total was a hefty $79.5 million, enough to put it among the better months of the year.

The September sales performance takes on added significance when one remembers that price increases effective September 1 drove in a lot of business in August. For many builders, September bookings were taken at the new higher prices.

Net new orders for the year to September 30 pile up to an impressive $737.5 million. That is $185 million more than in the first nine months of last year.

Let's not lose sight of that fantastic final 90 days in 1955 however, when the industry booked $374 million of orders, or 40% of the year's total. There is not a chance of that happening again this year.

New business taken by the industry in 1956, on the other hand, is almost sure to be greater than the 1955 volume of $927 million. To surpass that figure, builders need to get only an average of $65 million of orders in each of the final three months.

Machine tool shipments dipped a bit in September. They touched $71.1 million, compared with $75.1 million in August. No one seems to have a good explanation for the dropoff.

With production in the first nine months of 1956 getting up to only $629.5 million, it now appears unlikely that the entire year's shipments will be much more than $850 million. Nevertheless, that would represent a nice gain over 1955, during which $670 million was shipped.

In comparing new orders and shipments this year with last, one should take into consideration that the price level is higher now than then. The gain in physical volume of business is not as large as the figures indicate.

P&W in Lease-Back Deal . . .

Penn-Texas Corp has sold for $11 million the land and manufacturing plant (1.25 million sq ft) of its Pratt & Whitney subsidiary at West Hartford, Conn, to Sidney M Barton, who has leased back to Pratt & Whitney the land and plant for a 30-year term, with renewals allowed up to a total lease-time of 91 years.

Primary purpose of this action is to provide additional working capital to facilitate expansion of Pratt & Whitney operations, according to Leopold D Silberstein, Penn-Texas president. Pratt & Whitney sales in the first nine months of 1956 were the largest for any similar period in history. Current backlog is over $30 million.

The lease-back followed the same plan that was used by Penn-Texas with its Bayway Terminal and Colt's Patent Firearms subsidiaries.

Mr Barton is one of the largest operators in the real estate lease-back field and has dealt mostly in chain stores.

Though this is believed to be the first lease-back transaction in the U S machine tool industry, it has been used by at least one prominent British builder.

Czech competition getting hot . . .

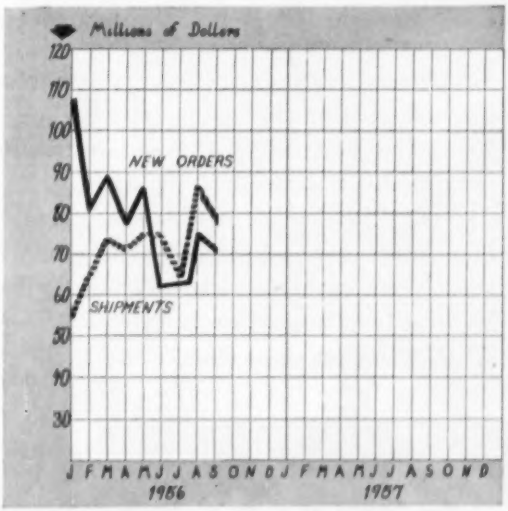
Czechoslovakia, center of heavy goods production in the Russian satellite area, built 21,000 machine tools last year, twice the 1948 volume and four times the amount in 1937.

Three-fourths of the Czech output of machine tools is exported. The Czechs say that their export volume is 80% of Britain's and one-third of West Germany's.

Sales are being pushed to the West, partly because Communist markets are dwindling as East European nations develop their own machine tool industries.

Last year, sales to western countries were double those of 1954.

Czech goal for 1960: Production of 34,000 machines weighing 140,000 tons.



DROP IN BOTH NEW ORDERS AND SHIPMENTS was registered for September on the National Machine Tool Builders' Association Index. New orders fell off some $8 million to $79.5 million, and shipments dropped from $75 million to $71 million

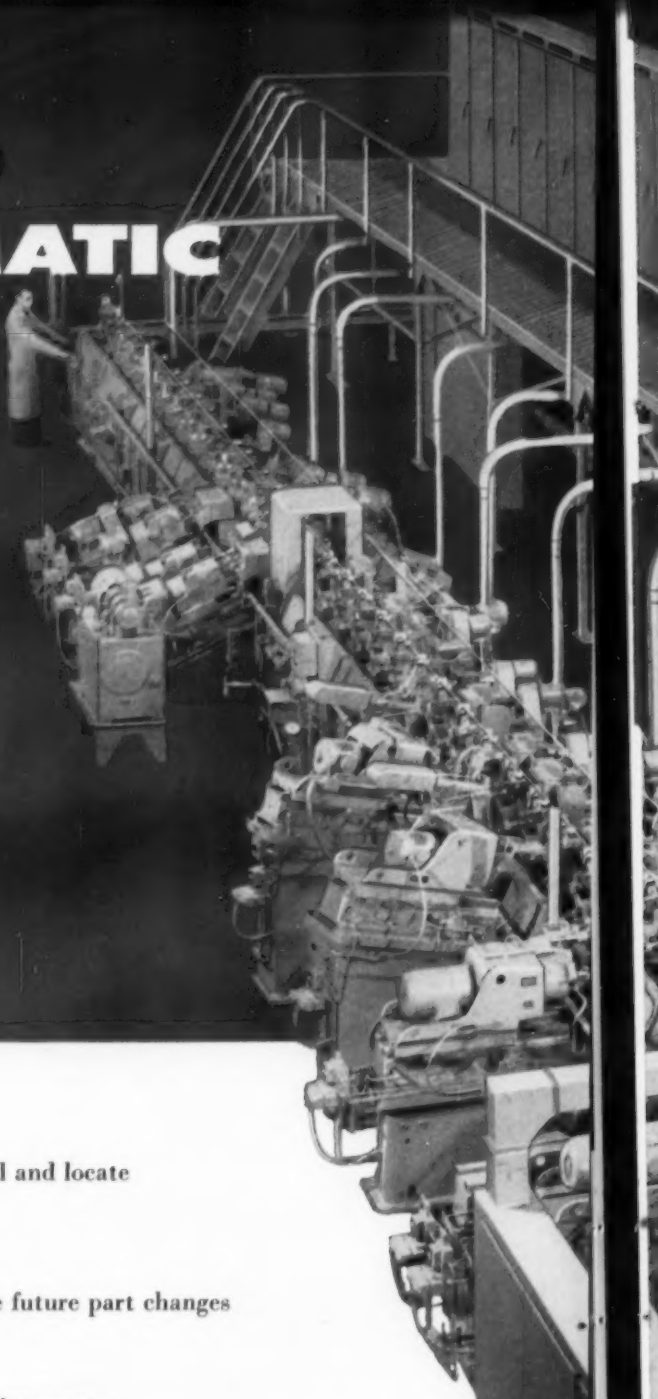
Buhr (43 STATION) ECONOMATIC

performs 84 operations every 21 seconds!

Production . . .
171 pieces per hour
at 100% efficiency

OPERATIONS . . .

23 drilling, 13 countersinking, 16 tapping, 4 reaming, 1 spotfacing, 3 drilling and 1 chamfering . . . plus 14 probing



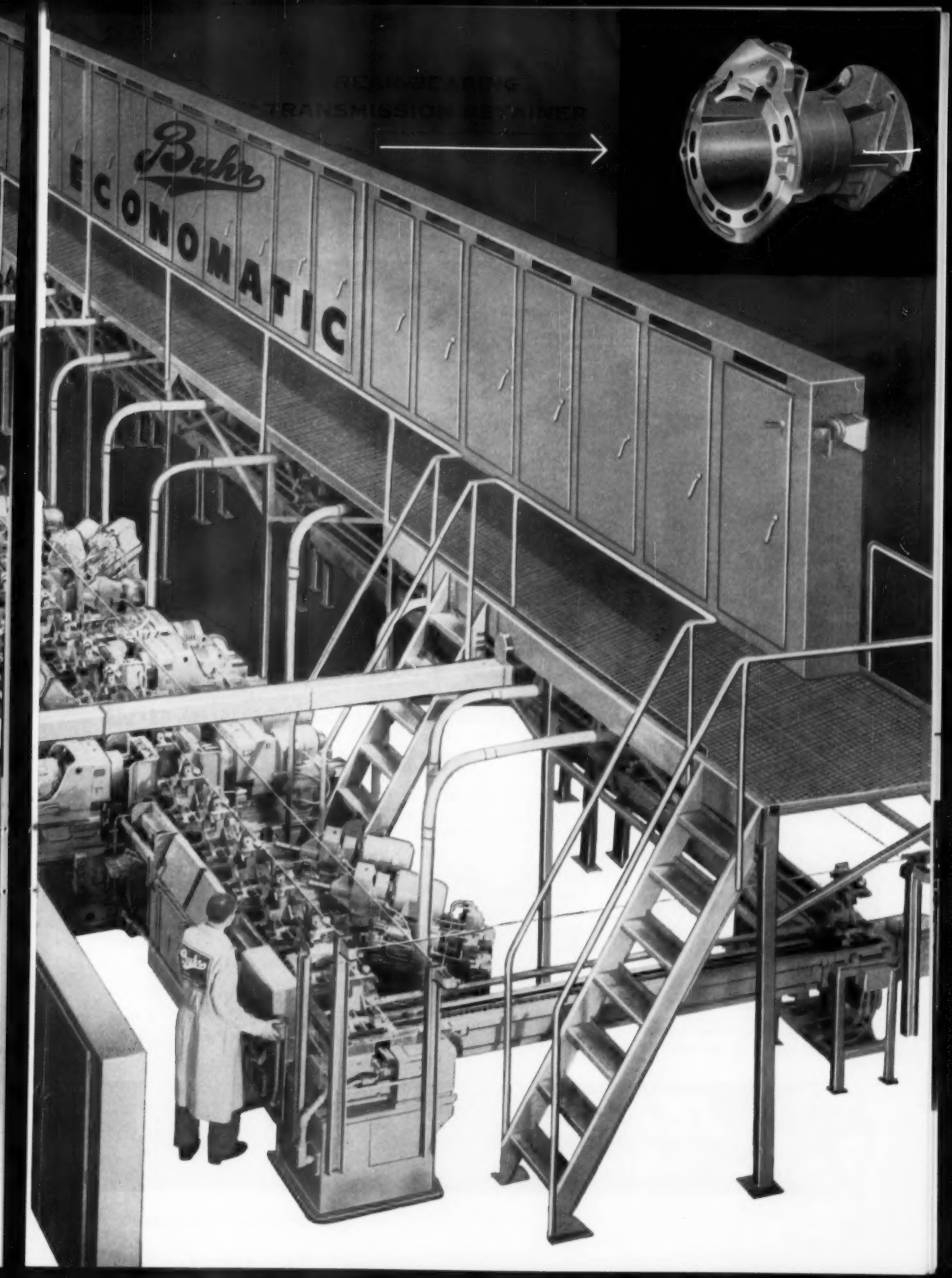
- Elevated electric installations
- Central graphic-control panel
- Exclusive Buhr Detector System in main console to signal and locate electrical failures instantly
- Telephone system with plug-in stations throughout
- Fixtures pressure-cleansed on return
- Distinctive Buhr Sectional-Base Construction to facilitate future part changes
- Central mist-lubrication on all heads
- Automatic lubrication of all moving parts
- Standard and special parts interchangeable for ease of maintenance
- Spindles arranged for pre-setting of cutting tools to minimize downtime for tool changes
- Hardened-and-ground steel ways
- J.I.C. Standards throughout

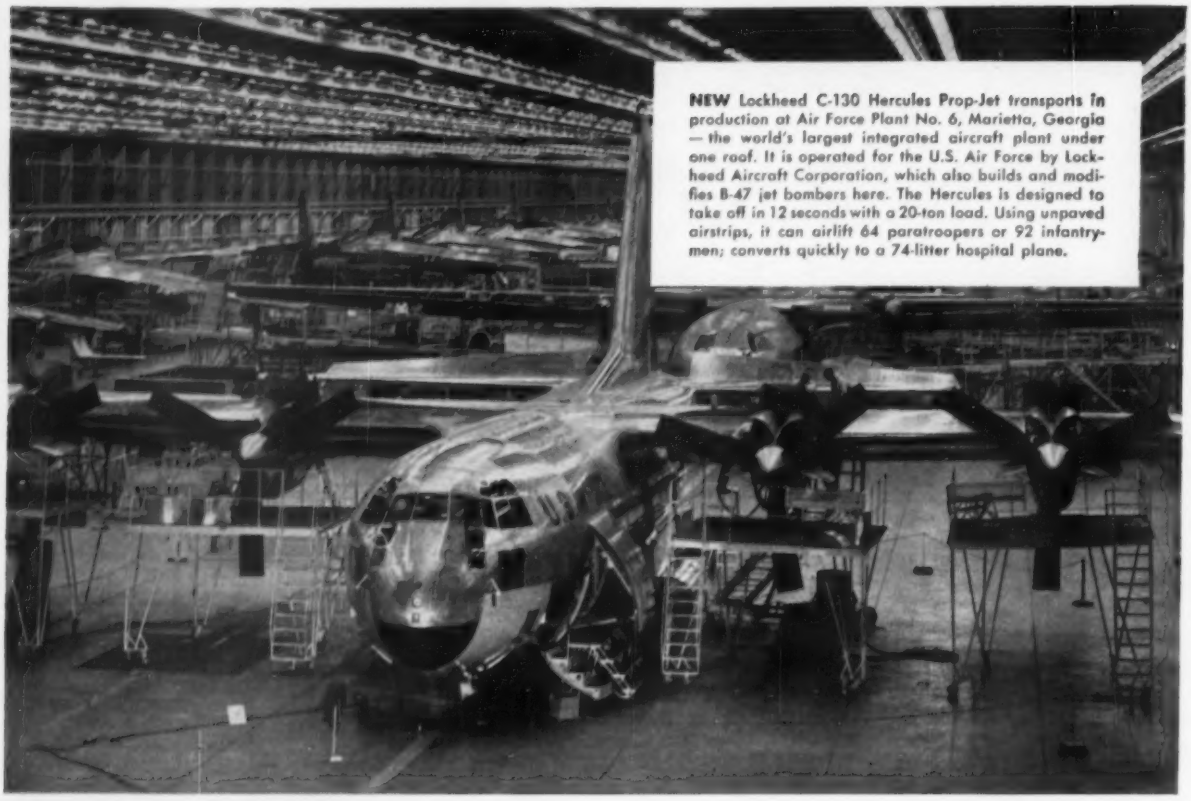
Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

BUHR MACHINE TOOL CO.©

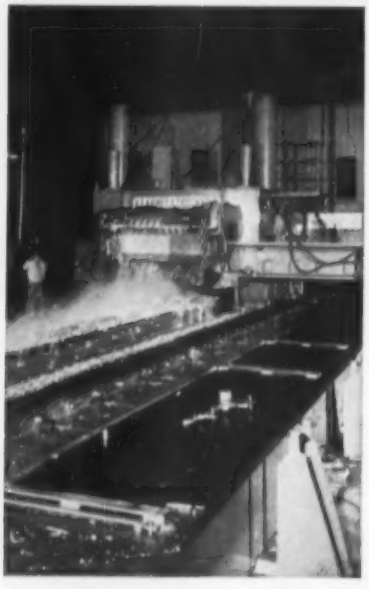
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers


Buhr
ECONOMATIC



NEW Lockheed C-130 Hercules Prop-Jet transports in production at Air Force Plant No. 6, Marietta, Georgia — the world's largest integrated aircraft plant under one roof. It is operated for the U.S. Air Force by Lockheed Aircraft Corporation, which also builds and modifies B-47 jet bombers here. The Hercules is designed to take off in 12 seconds with a 20-ton load. Using unpaved airstrips, it can airlift 64 paratroopers or 92 infantrymen; converts quickly to a 74-litter hospital plane.



Combination spar and skin miller operating in Lockheed plant. *Texaco Soluble Oil* emulsions are used exclusively in these operations.

How Lockheed keeps production on schedule and reduces costs

TO KEEP its metalworking operations on schedule and its costs in line, Lockheed uses *Texaco Cutting, Grinding and Soluble Oils* at its Marietta plant. For example—

Texaco Soluble Oil emulsions are used on all spar and skin milling operations. The resulting improved performance of the millers (even at cutting speeds above 5,000 s.f.p.m.), the greater cleanliness, the substantially longer tool life—all add up to on-schedule production and lower unit costs.

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Lubricants, Fuels and Lubrication Engineering Service

What's ahead ... in Metalworking

NEWS REPORT

Production-Plus Performance . . .

The metalworking industries are turning in a fourth quarter performance that lives up to its advance billing as being the best of the year.

Very large production totals are being rolled up in almost all segments of Metalworking. And current operations show signs of continuing at the current rate for some time.

Take industrial machinery. Output is running somewhat ahead of a year ago, yet little progress is being made in reducing backlogs.

The aircraft industry is swamped with huge orders and business should be tops for many months. Airplane parts companies report zooming activities.

Automobile makers finally are off dead center and assemblies are picking up fast. However, Detroit is playing it safe in making steel commitments, preferring to see how new models sell before giving releases for massive steel tonnages.

Electrical machinery demand is just as good as that for industrial machinery, with deliveries stretching far out into 1957 and, on certain large units, into 1958.

There are a few weak spots, to be sure. The farm implement industry is the most glaring example. Manufacturers have written off the chance of improvement the remainder of the year and are putting their faith in a turnabout early in 1957 (and that is a good bet).

The slowing rate of housing starts is being felt by makers of such equipment as plumbing valves, fittings and bathroom units. Some home appliance makers confess that sales have not been up to expectations.

Steel mills are filled up for this year and have opened books for first quarter on many items.

They still are making allowance for the possibility that Detroit will step up its releases (and they now confess that auto companies had more steel in inventory than estimated).

Gray iron demand at peak . . .

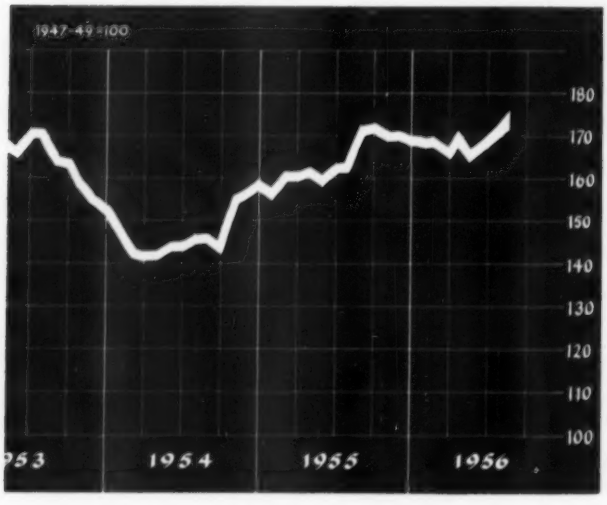
Gray iron foundries, expecting earlier that 1956 would be a record-breaker, now are willing to settle for about the same volume as last year—14.8 million tons of products. Drastic cutback in auto production and the steel strike are responsible for the lower production total.

The gray iron industry is at peak capacity right now. Heavy orders with short delivery dates from auto makers are spurring output. Backlog averages 6 to 8 weeks.

Producers of steel castings, by contrast, say that 1956 will be their biggest peacetime year. Production should hit 2 million tons, against 1.8 million in 1953. Construction equipment people and railroads are the best sources of business.

Current backlog is about 600,000 tons, with shipments running 170,000 tons a month. Good portion of the backlog, however, is for specialty items with long delivery dates.

Farm implement makers are expected to place a greater volume of steel casting orders the next few months.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

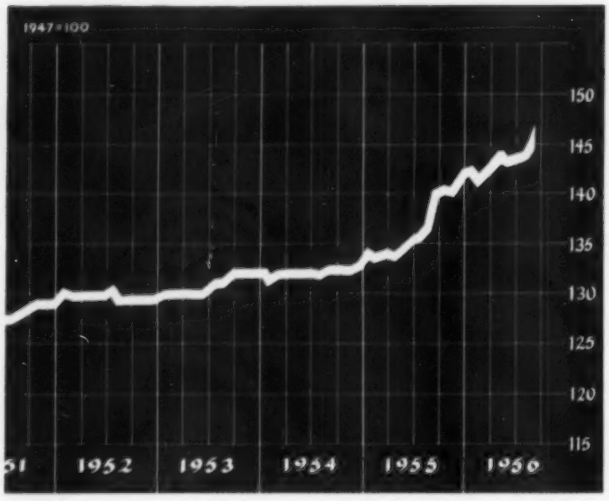
	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**176**	**174**	**173**	**171**
Machinery	**157**	**157**		**141**
Electrical Machinery	**213**	**211**		**205**
Autos	**81**	**103**		**133**
Other Transportation	**392**	**356**		**334**
Other Metalworking	**148**	**140**		**143**

NEWS REPORT What's ahead...in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**147.5**	**147.0**	**145.5**	**139.0**
Metalworking Machinery	**170.5**	**167.8**	**156.9**	
Other Machinery exc. Electrical	**154.9**	**153.3**	**145.2**	
Electrical Machinery	**146.1**	**143.7**	**136.0**	
Fabricated Metal Products	**139.6**	**138.5**	**132.9**	

147.5



Capital Goods, Consumer Spending Buoy Economy...

Nothing has altered the very bright business outlook over the months ahead, say until next July 4. Beyond that time, however, the situation looks obscure. That is not to mean that it won't be all right, but at the moment it appears foggy.

Two factors are responsible for the optimistic outlook, both of them holdovers.

One is the astounding expenditures for new plant and equipment, which have more than offset the decline in automobile production and in housing starts. Capital outlay next year promises to stay at a peak level.

The other is the remarkable buoyancy of consumer spending. For the country as a whole, it has gone up steadily during the year. Even more remarkable, in cities afflicted by involuntary unemployment (automobile manufacturing towns) and voluntary unemployment resulting from strikes (steel towns), consumer buying has not begun to reflect the loss in wages.

The rounds of wage increases play a major part in sustaining consumer spending. And that is why 1957 looks good for retail trade.

One of the striking aspects of the current business scene is the alacrity with which employers accept increased wage costs and build them into a structure of higher prices, with a view to passing them on to consumers of their products.

A big holiday trade looms ahead. As retail business goes into this period, it is hitting all-time highs both in dollar volume and physical volume. The proportion of income saved has been relatively large recently, so there is room for sales to move up.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	148.4	147.4	145.0
Steel ingot operation (thousands of tons)	2,489	2,495	2,413
Electric power output (million Kilowatt hours)	11,333	11,300	10,644
Production of automobiles and trucks	121,288	96,986	169,191
Engineering construction awards (Eng. News-Record—millions)	$550.5	$446.6	$295.2

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
New orders for machinery (1950=100)*	160	156	143
New contracts for industrial construction (1950=100)*	195	219	152
Index of industrial production (1947-1949=100)*	144	142	142
Index of durable manufacturers' production (1947-1949=100)*	163	159	160
Durable goods manufacturers' sales, millions*	$13,608	$12,627	$13,745
Machinery manufacturers' sales, millions*	$ 4,039	$ 4,032	$ 3,484
Durable goods manufacturers' new orders, millions	$15,106	$13,513	$15,145
Machinery manufacturers' new orders, millions	$ 4,153	$ 4,140	$ 3,833

* Seasonally adjusted

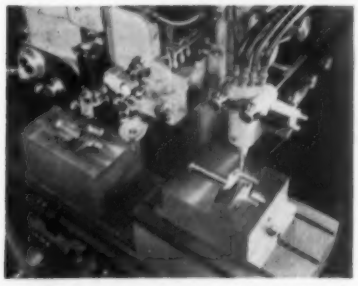
year after year

Biggest in Volume Sales

for tough die sinking!

Raise the Feed . . .
Reduce Die Costs with

T-J CUTTERS



T-J Cutter at work on a Cincinnati 16" Vertical Hydrotel. latest design Die Sinker.

Whether you have new machines or older types in your die and forge shop, you'll be ahead in *accuracy and production* with T-J Die Sinking Milling Cutters! T-J Cutters are *extra sturdy*... reduce die costs... preferred everywhere!

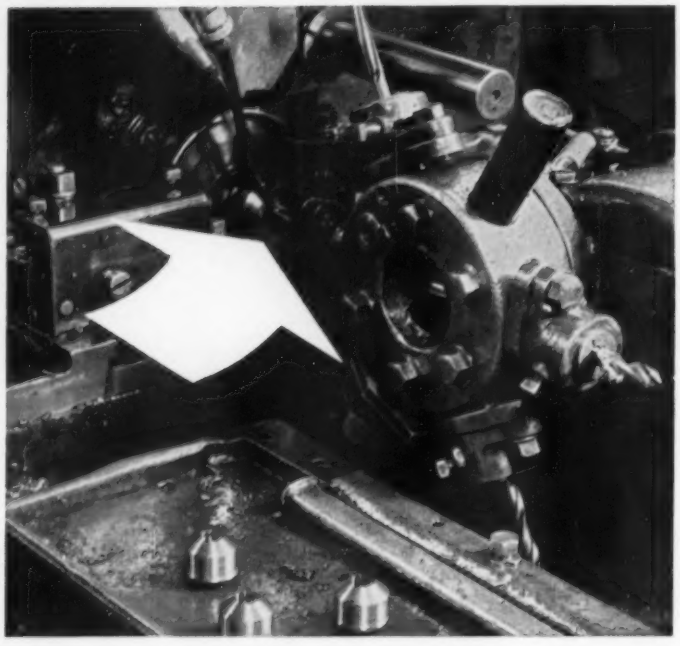
Designed for speed, accuracy and long life . . . less breakage . . . more work between grinds! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes. Send for new catalog No. 1055. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

39 Years Experience

Here's Where Armco Stainless Bars

CUT YOUR COSTS 4 WAYS



It's right at the cutting edge where machining costs are cut. And that is where Armco Stainless Steel bars can help you 4 ways.

Less "down" time

Armco Stainless Steel bars give you uniform machinability from end to end and bar to bar. You have no unnecessary, costly delays to adjust machine settings or tooling in order to maintain tolerances on size or finish. Jobs can be completed in a hurry, at less cost per piece.

Cost-cutting shapes available

Armco Stainless bars offer you a wide range of sizes in standard shapes and special shapes. These special stainless bar shapes give you the opportunity to reduce machining time and possibly eliminate entire operations. You save time and money, turn less bar stock into chips.

Armco Stainless can fit the job

Armco, one of the largest producers of stainless steel in the world, offers you more than 30 standard grades of stainless bars. This way you can select a grade that exactly meets specified strength and corrosion resistance requirements. And to save you money on machining, Armco offers you free-machining varieties in most of the commonly used stainless steels. Machining speeds range up to 85% of that for Bessemer screw stock.

Machining experience available to you

For over 20 years Armco men with shop experience have been helping shops get the most out of their equipment on stainless machining jobs. And they have run thousands of machinability tests. They know stainless steel and they know how to help cut costs and step up production. This valuable experience is yours for the asking.

• • •

If you are making corrosion resistant parts or quoting on them, consider Armco Stainless Steel bars. Let their 4 cost-cutting advantages work for *you*.

For complete information on sizes, shapes and grades of Armco Stainless Steel and for machining data, just fill out and mail the coupon today.

ARMCO STEEL CORPORATION
1116 Curtis Street, Middletown, Ohio

Please send me the following information on Armco Stainless Steel bars: ☐ Sizes, shapes and grades ☐ Machining data

We make_____

Name_____

Street_____

City_____ Zone____ State_____

ARMCO STEEL CORPORATION
1116 CURTIS STREET, MIDDLETOWN, OHIO

ARMCO® Rustless

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How to Keep Them Running

"One more automatic device added to those that clutter up my home and I shall never have time to come up for air or to see daylight.

"What's more, it isn't the original cost. It's the upkeep. What really takes the toll of housewives is the hours we spend on our knees begging repair men to mend the frail, ailing creatures."

This wail should strike a sympathetic note in every metalworking production executive. For one thing, he is a husband and gets pretty tired of calling and paying for a service man to do repair jobs that have baffled him as well as his wife.

But more than that, it serves as an unhappy reminder to him that his shop may be headed toward similar recurrent crises unless something is done.

Machines used to be simple . . .

and easy to repair. A maintenance man with a minimum of technical knowledge could take care of them.

This no longer is true. Machines are more complex. Look at one of the big fellows and see for yourself. The "business" part of it often gives the impression of being dwarfed by a lot of intricate accessories—complicated and bewildering control panels with a maze of pushbuttons and flashing colored lights, hydraulic units, work-transfer devices, perhaps involved electronic equipment.

Today's machines do many things that yesterday's machines couldn't do. They turn out much more work at a lower cost per piece. They perform their jobs with little or no aid from operators. They also do better work to closer tolerances.

But as these machines become more complex and more highly specialized, the less the regular shop production force knows what to do about them when they stop running. And like it or not, they do stop running now and then even under A-1 conditions.

There is the case of . . .

an automated machine that came to a halt around noon one day. Nobody around the place could find what was wrong. The trouble was not remedied until the afternoon of the next day when an experienced service man arrived from the builder's staff. Meanwhile production had been badly stymied.

This incident, to be sure, does not happen every day in such drastic fashion. Nevertheless it dramatically points up the case for training a maintenance crew with the skills necessary to cope with the problems of keeping today's highly engineered and intricate machines running with a minimum of downtime.

Members of this maintenance crew

are not just ordinary fellows. They are high-grade technicians if not graduate engineers. They are a far cry from the old-fashioned maintenance man with his kit of tools.

If you have a shop with new high-production machines and you are not yet thinking in terms of such a maintenance program, it is time that you do. Remember that you can get the maximum benefit from your new machines only if you keep them running.

Burnham Finney EDITOR

...this modern CINCINNATI PRESS BRAKE...

gets the orders...

at MARION MACHINE FOUNDRY & SUPPLY CO.
Marion, Indiana

This Cincinnati Press Brake immediately produced orders in a highly competitive jobbing market.

A $25,000 job, which previously would have been lost, was profitably handled. A 3' channel with 2¾" flanges was formed in six gauge material.

Investigate these modern design features for low cost production.

- Centerline loading
- Rigid, All-Steel Construction
- Deep beds and rams
- Interlocked construction
- Large, high strength radii—free of weld
- Ram elevation—complete with micrometer indicators
- Tilting ram adjustment

Write for Cincinnati Press Brake Catalog B-4

Photos courtesy the Marion Machine, Foundry & Supply Company, Marion, Indiana.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

American Machinist

7-phase plan breaks manufacturing bottlenecks

How can we expedite the transition from prototype to production model? The answer is more urgently needed every day, and particularly important for an adequate supply of the complex military devices now needed for defense. Mr. Kelly, who has spent many years analyzing critical production problems, says that the introduction of frequent change into the machine shop, whose essential nature is based on producing identities, is a major trouble source; that "reduction-to-practice" should be a separate and distinct phase. It is unreasonable, costly and time-consuming to expect the production shop to convert the prototype to practice, meanwhile maintaining all specifications and physical properties. Proper distribution of responsibility can reduce the waste.

PILSON W KELLY, ME, CPA, Treasury Services supervisor
FORD INSTRUMENT COMPANY, DIV OF SPERRY-RAND CORP.
LONG ISLAND CITY, NY

Today's industrial products, and particularly weapons and weapon defenses, have become fantastically complicated and bewildering, not only to laymen but often to the technician as well. It is not unusual for a production chief on radar devices to receive 1000 change orders within a few months. Ask him whether he is confused—and the temperature under his collar.

Because of such complexities, even though the machine shop is, with the help of "science," one of the controlling elements in our survival and our standard of living, we are losing a great deal of the effective use of our shops. This is no new discovery. Shop men have realized it for many years.

One pattern of habit may provide a clue to the trouble, and a key to the remedy. Most shop men have given many hours of deep thought to methods of adapting the machine shop to our modern concept of the work to be done, especially in military manufacture. **But little thought has been given, generally, to the matter of adapting our concept of the work to be done to the essential nature of most machine shops.**

No sane person would even suggest that the advances of science and engineering be modified to suit the habits of shop practice. Most of our technological progress has resulted from the ability of inventive, ingenious shop men to solve manufacturing problems. However, there should be a distinction between the development of a sound manufacturing process and the production of the object to fulfill a demand. Combining these phases weakens the effort of both.

The first accomplishment of the rational mind is identity, and the first level upon which to examine anything is the plane of identity. The chief characteristic of a machine shop is the tremendous number of identities involved in the product, usually in the order of millions of details. It is a small shop that

doesn't handle 50,000 different parts, each with many operations and with changes in design, shop method, material, and labor.

This is the condition in most shops making the same products for years; shepherding these millions of identities into the products sold is a huge task. Planning the work, scheduling each batch of every part for each machine or assembly operation, routing the actual parts, all represent a life-time career to an able man in any large factory. Of course, new and strange products, such as modern wars are fought with, create even more difficulty.

Even with these methods, the millions of identities could not be mastered if manufacturing were done by machining each part separately to each dimension. This brings us to the nature and extent of special tooling, the dies, jigs and fixtures. Generally, special tools are limited to a single identity and are worthless for anything else. Special tooling is one of America's contributions to civilization and, until World War II, was little known abroad.

The American machine shop is capable of startling quantities of production if: (1) It is properly supplied with material. (2) It is making a single product, or a small range of products which retain their original identity for considerable periods of time. (3) It has adequate special tooling which agrees with the parts to be made. (4) Its planning, scheduling, and routing are in good shape.

CHANGES LOWER OUTPUT

The basic weakness of the machine shop is its resistance to change in these four requirements. That is, a small change in any one of them is likely to produce very large reduction of product. For example, an automobile factory operating within the four requirements will turn out several miles of cars a day. But if, at start of work, someone required the crankshafts to be 0.020 in. shorter, there would not be a single car produced that day, and maybe not for some time. . . . When you have a system, the system has you.

Anyone in government procurement or contracting will tell you that there are two kinds of work: Research and Development (R & D) and Production.

An idea is conceived by the Armed Services, by a contractor, or by someone at a university, and one of the few things known about it is that such a device might be helpful to national defense, if it could be made to work. The device itself doesn't exist, and often nothing like it exists. Several contractors are invited to propose methods of approach and estimates of cost, and the fellow with the most promising method and best cost estimate is awarded a Cost-Plus-Fixed-Fee contract, with a limit on cost.

PROTOTYPES VS PRODUCTION

The device frequently treads the frontiers of several sciences. The best available technicians in the particular field go to work, assemble instruments and devices, and study their behavior until a combination capable of producing the desired results is achieved. The parts usually are assembled on wooden planks or flat metal plates. This is known as the "bread board" stage.

Now the device must be built into a working model, called a prototype. Of course, to make one of each part, special tooling cannot be afforded, hence the parts are made largely by hand with little regard to production methods. The only merit of the prototype is that it works, though sometimes by a slim margin. With the acceptance of the prototype and a set of its drawings the R & D contract usually is completed.

The next step is the award of a production contract, usually fixed price with redetermination. The basic assumption is that after one of the new devices has at last been made, we are now ready to make thousands without much trouble.

Production men examine the prototype drawings, converting the crude prototype parts so they can be made by quantity-production methods and a set of shop drawings.

Then tool designers draw up special tooling to exactly match the shop drawings of the device. Thus far, everyone in the shop is on apparently firm ground. Habitual methods are adequate for the problems. People are doing just what has been done successfully in every good shop for at least thirty years. But things don't stay that way long. Each morning's mail, and often the noon and mid-afternoon mails, bring sheaves of *change orders*. The government is improving the design. Then come the hundreds and thousands of contractor-made changes necessary to make the device fit together. Next come the material changes, with consequent design changes, to work around slow delivery of scarce materials and skills; changes to facilitate assembly by the grade of labor available.

Suddenly, one day a shiver runs through the shop office. The production model has failed the cold test, 60 F below zero. Investigation shows that mechanical and electrical specifications do not agree with functional or performance specifications. Ten parts must be made to obtain one "good" one.

THE CONFLICTS

By comparing the present process of weapon production in the shop to the four chief requirements for effective shop operation, as previously identified, we find diametrical conflict at each of the four points.

Material largely consists of purchased parts and assemblies, and because of the change orders, these do not hold their identities. Many are useless on arrival. Revised quantities take time and, frequently, there is a shortage of critical parts. Generally there is no such thing as assembly-line production; parts made in the shop come under the same lash. Each change is likely to render several expensive special tools useless and, especially in wartime, the first scarcity to appear is in the supply of toolmakers.

Planning, scheduling, and routing of the relatively simple product parts a factory has been making for years in peacetime now is a tremendous task. In providing the parts for new, strange, and ultra-complicated weapons, during a snowstorm of change orders, these activities acquire close similarity to the process of frying live tomcats. The best machine shops and shop methods bog down under complexity compounded by change orders.

THE ORIGIN OF CONFLICT: REDUCTION TO PRACTICE

Anyone will tell you that there are *two* kinds of military work, R & D and Production; actually there are *seven* kinds of work, as different as chalk and cheese. Some of these are in reasonably satisfactory condition, which doesn't mean that improvements cannot and will not be made. On the other hand, some of them are in very sorry shape indeed, for understandable reasons. This doesn't mean that things should be allowed to remain that way.

This situation appears to be:

Kind of Work	Highly Developed	Poorly Developed
1. Pure Science	X	
2. Development	X	
3. Prototyping		X
4. Reduction to Practice		X
5. Producibility	X	
6. Special Tooling	X	
7. Manufacturing	X	

Trouble spots are best explained on the plane of reduction to practice. This means that a device can be made reliably by reasonably available means. The distinguishing mark of reduction to practice is that the physical specifications (mechanical, electrical, chemical) agree with the functional (performance) specifications. If the device is built in accordance with the drawings and physical specifications it will, except in minor instances and except for minor adjustments, meet performance specifications.

Further, with proper maintenance it will continue to operate for reasonable periods of time. Though not part of the definition, a device truly reduced to practice is notable for simplicity rather than complexity, and enough thought has gone into it to enable the device to hold its identity for considerable periods.

Now the treacherous thing about true reduction to practice is that it is such powerful stuff that a little of it goes a long way, and despite the wonders produced by American industry, very few men ever obtain much broad experience on reduction to practice of peacetime products. The best that can be hoped for is that methods people will keep abreast of the knowledge by reading their technical publications, and visiting other plants.

This seems strange, at first, but let us consider this example. Visit a can-opener factory. Thirty years ago, the founders and inventors devised a good canopener; they obtained extensive experience in prototyping and reduction to practice. But they did such an excellent job that few of the men now in that factory get real experience on anything but replacing worn-out tools and operating punch presses.

One more consideration. If you wished to learn pure science, toolmaking, or manufacturing methods, there are hundreds of fine schools available. But where would you go to learn prototyping or reduction to practice? The simple truth is that American industry, or any other, doesn't know nearly as much as it should about prototyping or reduction to practice because few men ever have the opportunity to learn them, for reasons discussed.

After the R & D prototype is accepted, and if a production contract is received, the prototype and its drawings are sent to the Shop-Design Drafting Room, and this is done under several forms of self-deception, the main ones being the *lead time*, *liaison*, and *hurry* fallacies.

Lead-time error goes this way. Deliveries are scheduled to begin some months after contract award. The tacit assumption is: "What more time could anyone want to make a few drawings and tool up?" The device is usually much more complicated than the automobile, which required decades and millions of dollars to reduce to practice. The prototype is often a marginal device, and reduction to practice, which is seldom even mentioned, lies in a field which has no real technology nor effective method. The essential nature of the work of reduction is change, yet the work is usually done by shop men, all of whose instincts, training, happiness, and welfare historically lie in producing an identity. Lead time of itself is of little use.

POOL NEEDED KNOWLEDGE

Liaison is a little different. It is possible to expand upon the excellence of the team; upon the liaison between R & D and Production Departments. But in many organizations, the two kinds of work are done in different buildings, even in different cities. There are more subtle planes of cleavage. The R & D men are usually young, and well up on transistors, radar, and moon rocketry, while their opposite numbers in the shop are usually older, interested in the more prosaic but certainly no less important matters of what can be produced on turret lathes and screw machines by tomorrow night to meet delivery schedules. Great things are not done by liaison; but they *are* done by providing methods which are tougher and quicker-acting than the problems.

The "hurry up and wait" fallacy goes this way: "Of course we would like to allow ten years to knock the bugs out of the Gismo, but these things have to be flying over Katmandu or the Aleutians in nine months. That's why we put them into the shop half-baked."

This appears to be a poor and inefficient reason for hobbling our machine shops with thousands of change orders, practically all of which are caused by lack of even elementary reduction to practice. "The more hurry, the less speed" applies here.

To restore the effectiveness of our machine shops. by permitting them to do the one thing they are inherently capable of doing well, that is, produce identities, it is respectfully suggested that the following steps might be carefully considered by both government and industry.

1. **Recognize reduction-to-practice** of weapons and weapon systems, which is rarely mentioned, as something close to National Technological Objective Number One.

2. **Make reduction-to-practice a** separate contract. This would encourage contractors to set up their organizations with separate divisions for reduction to practice, which is at least as important as the R & D and Production functions, which customarily constitute separate divisions.

3. **Pool what little** government and industry know about reduction to practice. Study its nature further; devise effective methods and reduce the subject to a technology, just like mechanics, hydraulics, or microwave.

4. **Attract men of intelligence,** talent, and natural inclination to the work of reduction. Institute schools, courses and lectures by men of accomplishment and understanding, with suitable incentives and encouragement.

5. **Utilize** the scientist's method of experiment. Put one contractor to making a new complicated device in the usual way. Let another contractor of about equal reputation provide equal total contract quantity at the same time as the first contractor, *but put his chief effort on reduction to practice.* Compare the costs and the quality of the products.

6. **Meanwhile,** consider recognizing the principle that *when performance specifications disagree with physical specifications, penalties for spoilage and guaranty are unreasonable and improper.*

7. **Gradually work toward** the time when men, on seeing a job go into the production shop before reduction to practice, will think of Bismarck's dictum: "There are worse things than crimes; there are blunders."

One setup completes secondary operations

Tailoring standard machine tools and accessories for a specific job is one way Hartford Machine Screw Company, Hartford, Conn, solves today's increasing demand for quality and production. Tooling that permits completion of the part in one setup takes considerable ingenuity, but it pays off

As an example of the principle of tailored tooling, let's discuss a timing-pin body, for which HMS got large orders. Blanking this part, with the flats, did not present any difficult problems for the screw-machine department.

What at first seemed difficult was the slot at the end of the piece and the elongated slot in the side. Specifications required these slots to be in direct location with flats on the screwmachine blank. While this slotting could have been accomplished in several secondary operations HMS decided against this method for several reasons:

1) Transferring the part from one setup to another meant loss in quality, because each time the part is shifted an accumulation of tolerance develops.

2) The part was to be made in large quantities and was very competitively priced. Handling runs up the cost in a hurry.

3) Less handling would mean smoother flow and more constant production, with minimum danger of error.

HMS decided to build a single-purpose machine around the part and do all of the secondary operations in one loading. After the customary trial and development period in which the "bugs" were ironed out, a setup evolved which gave 850 pieces per hour.

Here are the operations performed by the machines:

1) Operator loads piece in fixture in an eight-station circular indexing device.

2) A small air cylinder seats the part more firmly in the fixture. The air cylinder is synchronized with operation of the machine.

3) Another small air cylinder exerts additional push on the handle to hold the piece firmly during cutting, also synchronized.

4) Piece is slotted on the end.

5) Elongated slot is made in the side of the piece.

6) Slotting burr is removed from 3/16-in. hole.

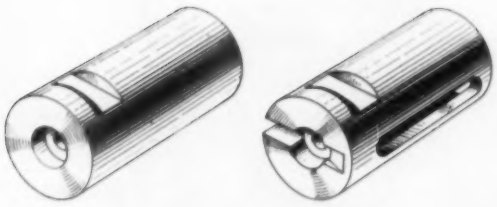
7) Fixture is unlocked automatically and piece is ejected by air through a tube and into a tote box.

Operation of the machine is controlled by a pedal. If something goes wrong the operator simply releases the pedal and the machine will stop at that index station. The only coolant used is on the slotting and grooving operation; oil mist works efficiently and keeps the setup clean.

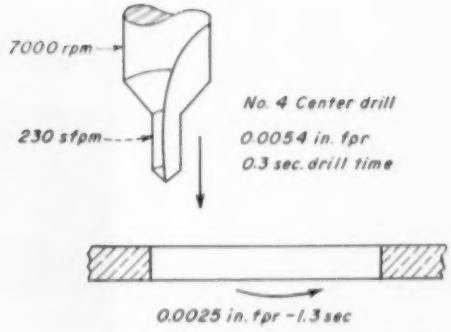
The two important stations in this setup are the fourth and the fifth above. In the first operation, horizontal and vertical, the end slot is made. Using a 2½-in.-radius slotting saw, an off-center slot is accomplished by the joint use of a Kingsbury drilling head and a small hand-milling machine converted for the job. A standard cam provides the slotting motion.

Tied in with the drilling head, the milling head is mounted on an upright column. The slot is produced in 1.9 seconds.

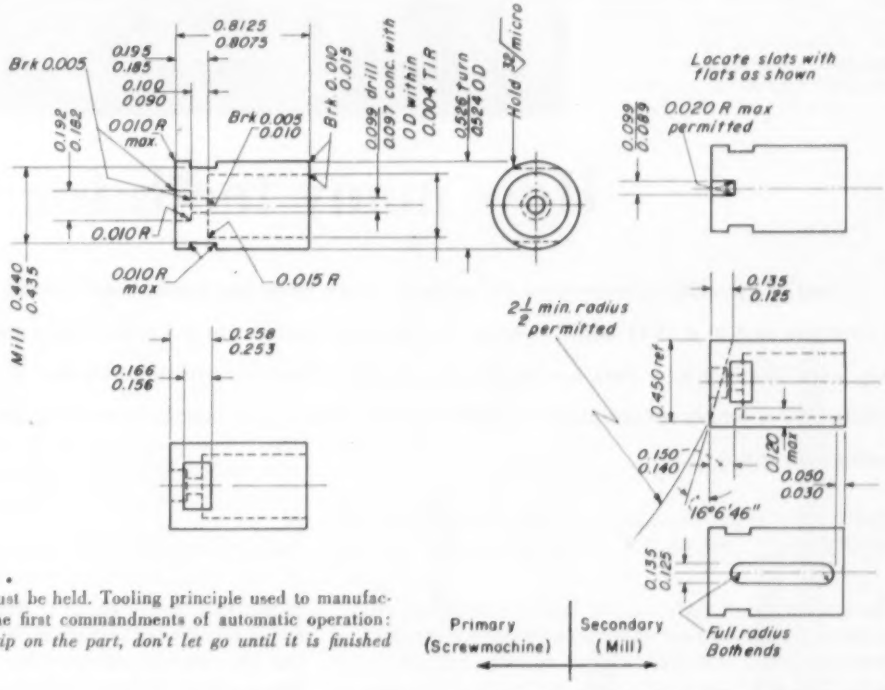
In the second-station vertical position the ⅛-in.-wide by ⅝-in.-long side slot is produced in 2.0 seconds. Again a Kingsbury drilling head is used, but this time it is pivoted at the motor end through a shaft and pillow block arrangement. The normal cam has been replaced with a special two-faced cam in which one cam produces the ⅛-in. drilling motion while the other cam dwells. In slotting, the procedure is reversed. The drilling cam dwells while the slot is being milled. Incidentally, the slotting motion is an arc, with the center located in pivots at the motor end. A roller bearing was installed on the quill to "take up" any thrust caused by slotting. Approximately 5000 pieces are produced per sharpening. The slot is cut by a simple No. 4 centerdrill. Material is aluminum alloy.



Aluminum-alloy timing-pin body . . .
would logically be produced in a series of operations requiring separate setups. Instead, blanks are produced on a screwmachine and the secondary operations are completed in a single special machine, made for the job. With output of 850 pieces per hour, scrap is negligible



Setup to cut elongated slot



Detail drawing . . .
shows tolerances which must be held. Tooling principle used to manufacture this part is one of the first commandments of automatic operation: *Once you have a good grip on the part, don't let go until it is finished*

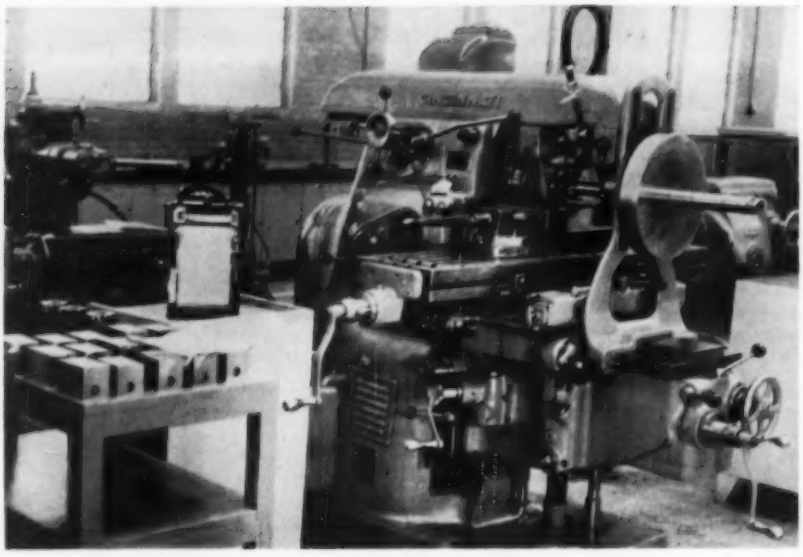
• • • • • •

Cooker is Made of Inconel-clad Steel

High resistance to corrosion of a sulfate digester is insured by fabricating from Inconel-clad plate. First of its kind to be made in Canada, the unit was fabricated by Dominion Bridge Co Ltd, Montreal, from steel plate with 7/64-in. cladding, except the conical section, which is 9/32 in. thick.

The main vessel seams were machine welded on the outside by submerged-arc welding, followed by hand welding on the inside. Before hand welding, each seam was back-gouged to clean metal and built up with carbon-steel weld metal to within ⅛ in. of the underside of the cladding. The seam was then completed with Inco No 142, 80/20 nickel-chromium electrodes. Because 100% radiographic inspection was required, the electrodes were heated to 450 to 500 F immediately before using to eliminate porosity. A minimum of two layers of the 142 electrode was necessary to insure proper chemistry of the finished surface.

Nozzles and manways were Inconel lined, and thermometer connections were made of solid Inconel. For welding Inconel to Inconel, a standard Inco No 132 electrode was used. The raised faces of all nozzles were layer welded and machined level, and the junctions of all nozzle and shell linings were made with special care to insure complete and uniform corrosion resistance at frequent trouble spots. (See also, *How to work clad materials, AM–Feb 6 '50, p99.)*



Test setup . . .
was on Cincinnati 2MH universal miller, equipped with 112-lb boiler-plate flywheel to smooth out vibration for cutters with few teeth. Test workpieces (left foreground) were drilled for strap clamps that weren't used, after all

How many teeth for the best

". . . most of the milling cutters now in use have many times too many teeth," is what Arthur A Schwartz said at a 1943 ASME meeting. But standard cutters are still being made the same as they were 20 years ago. Here are results of a limited laboratory investigation that show better milling (lower power consumption, as-good or better finish) is possible with only one or two teeth on the cutter

JOHN LIPSCOMB, Engineering Dept, DOUGLAS AIRCRAFT CO and
PROFESSOR O D LASCOE, Department of General Engineering, PURDUE UNIVERSITY

The aim of these tests was to take an identical cut across several standard workpieces with milling cutters that were identical, except for the number of teeth. Therefore, any difference in results could only be a result of the number of teeth.

The cutters were all light-duty slab-milling cutters, 3x3x1¼ in., with the standard number of teeth —12. One was left as purchased, and the others were ground so some of the teeth cleared the work completely, making, in effect, a series of cutters with 12, 6, 4, 3, 2, and 1 teeth. An extra cutter with 8 teeth, but otherwise identical, was added. On all cutters, there was a 25° helix, 5° primary clearance, 5° secondary clearance, 15° radial rake, and identical lip angles.

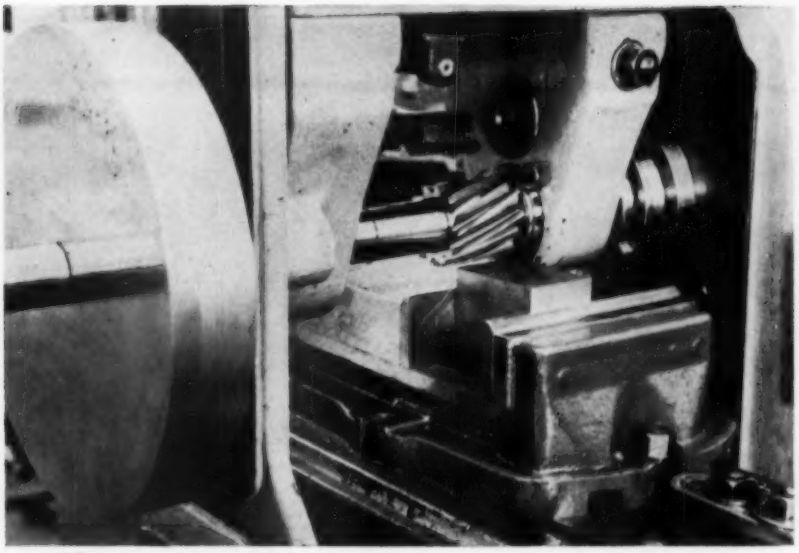
Sample work was a set of fully annealed SAE 1438 blocks, 4x4x2½ in. Setup was made on a light milling machine in good condition, with spindle speed at 114 rpm, feed at 7¼ ipm, and depth of cut at 0.10 in. Coolant was used.

MEASUREMENTS

An accurate recording wattmeter was hooked up to measure power input to the machine, and a standard prony-brake test was made to determine exactly the amount of power at the spindle. Surface finish was checked with a Profilometer. Theoretically, machinability of a given cutter can be determined by considering power required, surface finish on the work, and tool life; but there was no appreciable wear on the cutters during this short experiment, so tool life had to be ignored.

Altogether, 100 passes were taken across the sample workpieces; one series of ten cuts with each cutter, plus some additional passes with the 1- and 2-tooth cutters. Results were conclusive. Power requirements decreased almost uniformly as the number of teeth was reduced, despite the fact that the chip load increased at the same time. Two exceptions —with 3- and 4-tooth cutters—were noted, but rough readings taken during the first few revolutions in the cut, before chatter developed, showed that these cutters also bore out the less-power theory.

Surface finish was good throughout the test. There was some waviness on all the cuts, which seemed to stem from the high feed rate. When lighter cuts



Cutters were all light-duty . . .
slab-milling tools, and cut straight across the top of each block. Vise clamping proved better than straps; one strap is tightened on table (lower right) to prevent vise shift

milling cutter?

were taken with 1- and 2-tooth cutters, this disappeared. A higher helix angle—from 45° to 60°—might well permit higher feed and good finish.

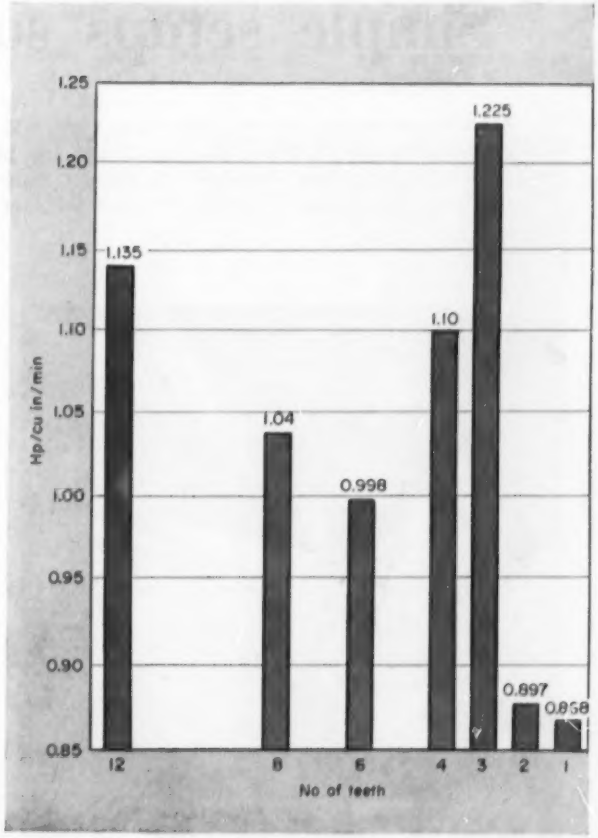
The single-tooth cutter tended to dig into the work, producing a depth of cut that varied from 0.10 in. This might be reduced with a larger flywheel. At a smaller depth of cut, the single-tooth cutter produced a better finish. But under conditions of the experiment, the 2-tooth cutter performed better.

One conclusion is obvious; with a machine in good condition and with sufficient power, milling can be done with a cutter of one or two teeth, saving up to 23% in power drain over milling with conventional cutters.

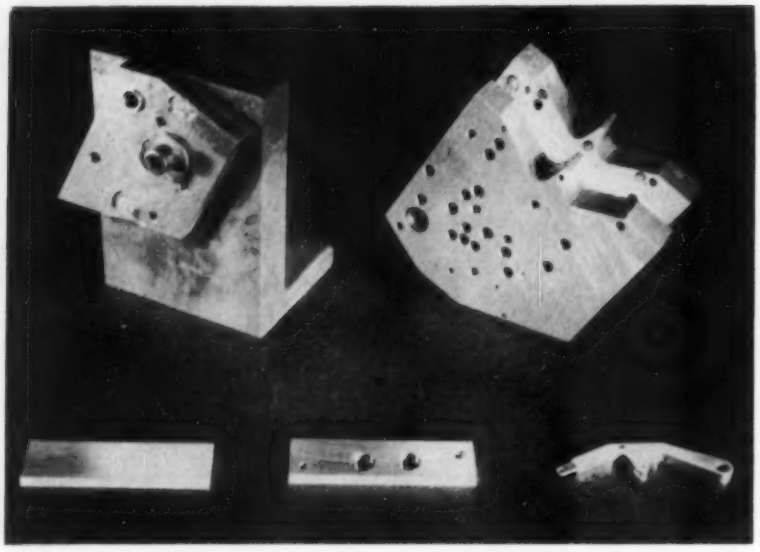
Results of tests with 1-12 teeth

No of Teeth	Average Power, hp/cu in/min	Average Finish, mu in., rms
12	1.143	26.1
12	1.138	21.3
8	1.041	26.4
6	1.026	26.8
6	0.973	28.9
4	1.106	29.0
3	1.149	27.9
2	0.877	27.2
1	0.885	30.8
1	0.850	27.9

Power ratings were taken from meter . . .
but have been corrected for no-load power drain, and indicate actual drain in the cut. Ten passes were averaged for each line of data. Unusually high readings for 3 and 4 teeth are result of chatter



Drop in power drain . . .
is almost straight-line from 12 teeth to 1, discounting chatter-warped readings at 3 and 4 teeth

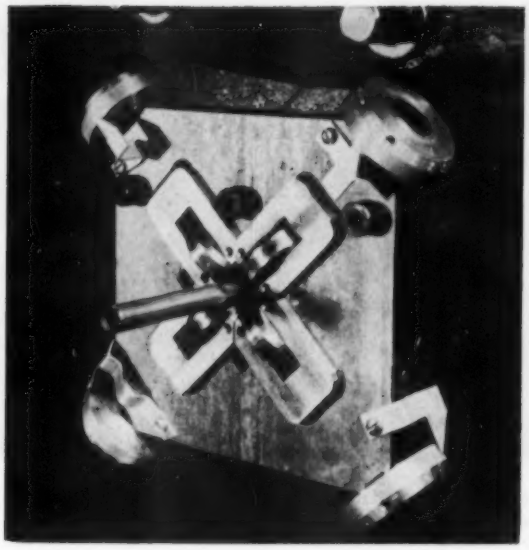


Simple box fixture . . .
for detent lever (lower right) permits clamping part once and then milling all of the surfaces and angles with only one change of location. Base (left) is used to mount fixture (right) on table of miller, to permit swinging fixture to necessary positions. Each face or angle to be machined is located by inserting a pin into the proper hole

Simple setups solve shop problems

Servo Corporation of America, New Hyde Park, NY, develops and manufactures precision electronic and electro-mechanical systems. Each day brings new problems of "reduction to practice," the bump in the road of development discussed on page 113 by Mr. Kelly. Ingenious tooling and smart methods still keep the products flowing. This assembly of ideas may provide one that gets you out of trouble.

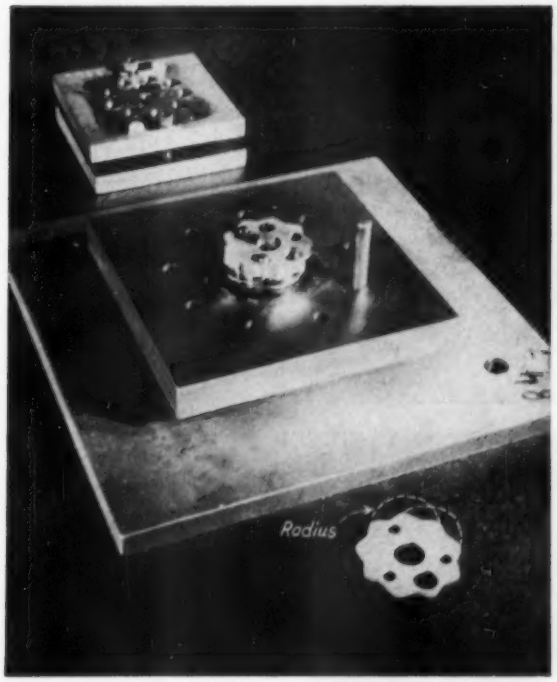
Square thread . . .
was cut to close tolerance in type 304 stainless steel by starting with centerless-ground rods, running true within 0.0005 in., and passing them in a snug running fit through a hardened-steel guide bushing on a toolmaker's lathe. Guide bushing is mounted in a follower rest especially constructed and bolted to the cross-slide frame. Single-point tools of HSS cut right at the point where the rod leaves the bushing. Tools are ground with a very slight taper from square, less than 1°, but enough to prevent workhardening the stainless. Coolant is either oil or Cimcool. Screws are either ⅝-8 by 31 in. long or ¼-10 by 28 in. long; are machined in 5 hr each using four tools in the turret. Maximum permissible runout, end to end, is 0.005 in.



Square tubing . . .
was expensive, especially in odd sizes, so shop men decided to make it from round. Tubing was used to overcome difficulty of broaching accurate square on solid rod. Since then tube has proved better; with much less distortion and change during manufacture and less vibration in the instrument. Setup is on an old milling machine, with roller die suspended from the head and a pull block rigidly attached to the table. Table feed is used to pull 7/16-in.-dia tube, securely fastened in pull block, between the rollers, which are hardened, ground, and mounted on needle bearings homemade from hardened dowel pins. Type 304 stainless steel tubing is converted from round to square in two passes: rough form and size to dimension. Heavy socket screws set in micrometer heads provide adjustment on each roller. Square tube is held to an accuracy of 0.308 +0.000 −0.001 in. Original length of 33 in. grows about 1¾ in. as a result of rolling. No lubricant is used and distortion is negligible. Feed is 6 fpm

at Servo

WILLIAM M STOCKER, JR, associate editor

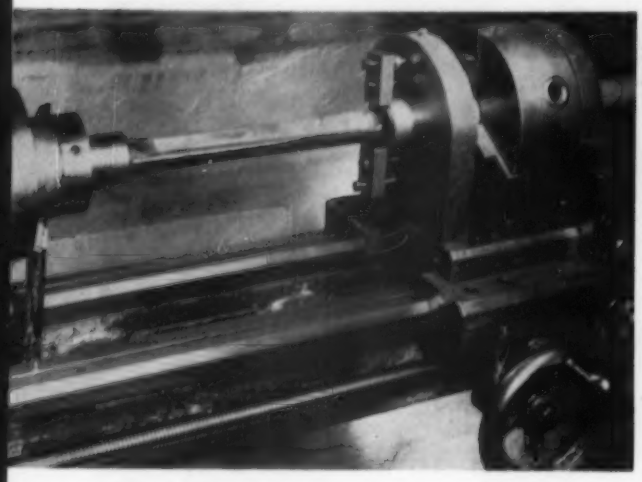


Nine-lobe detent cams . . .
are milled, five at a time, by locating blank in fixture, then moving pin from hole to hole in the fixture. Pin enters hole in lower plate which is mounted, offset, on a rotary table on the miller. Rotating table describes a radius which includes opposite faces of alternate lobes. In 24S-T aluminum, cams are made in 0.455 hr per pc. Jig is used to drill before milling.

"Quick-and-dirty" diemaking . . .
produced excellent results when toggle clamps were needed in a hurry. Parts are made from 0.091-in.-thick type 304 stainless strip on hardened tool-steel dies made in the shop. Four operations—pierce, blank, stamp emblem, and bend—complete the piece. Two radii meet to form "bump" for latch, without machining

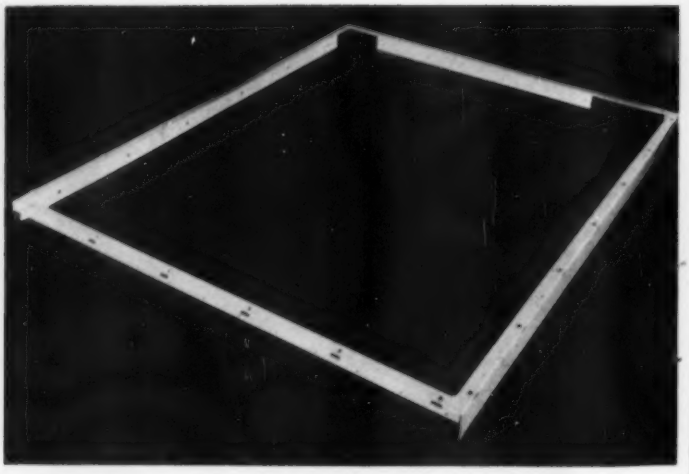
PLEASE TURN PAGE

Simple setups solve shop problems at Servo . . .



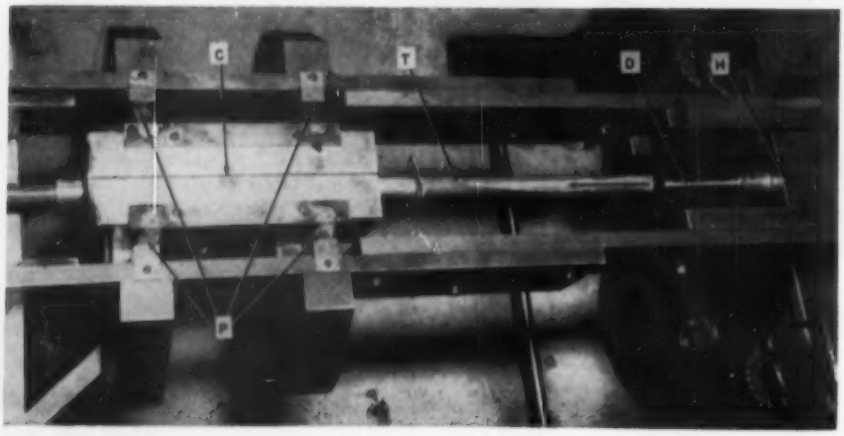
Chrome-alloy tubing . . .

required a hole within 0.001 in., yet it was very tough and work resistant. Problem was solved by a homemade gun-reaming setup on a discarded Logan lathe. Carbide gun-reamer is rotated at 500 rpm with tube fed at 0.0015 in. per rev. Oil is supplied by lathe's coolant pump. Tube is centered by three-jaw chuck aligned with reamer guide bushing in fixture



To avoid distortion . . .

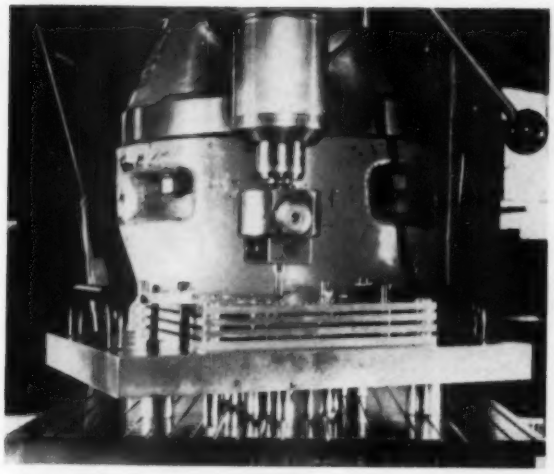
frame for plotting board was made in one piece from 51-S-0 aluminum. However, biggest press available was a 125-ton Bliss. Blank is made by using double-angle shear on each of all four sides, with the angle just a little more than the thickness of the stock. Four operations—blank, pierce rivet holes and slots, form, and pierce clinch-nut holes—complete the frame, including square edge at slot for flush mounting. Dies are CRS with hardened tool-steel punches

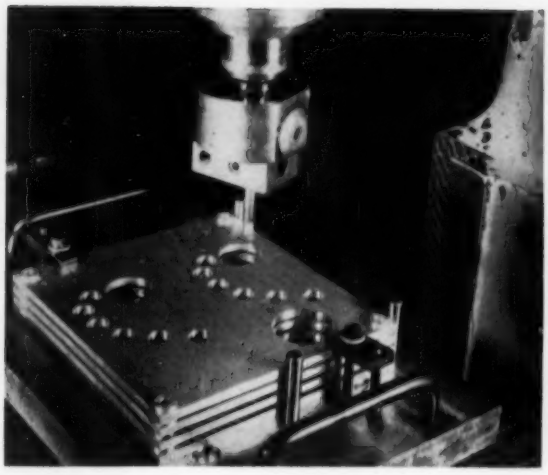


Toggling . . .

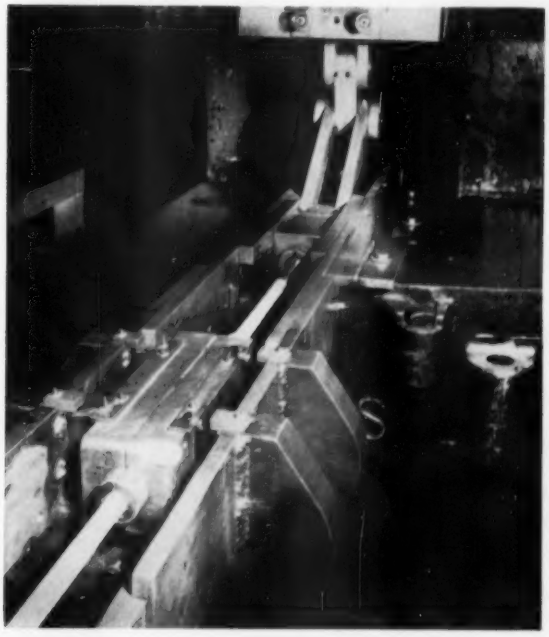
proved the answer to getting a 1000±ton squeeze out of a 125-ton press. In assembling an antenna consisting of four sections force fitted together and requiring good electrical conductivity through the joints, a huge force was necessary to drive the couplings to an accurate depth. Tubing is chrome-steel alloy and coupling is stainless steel. Mr Schmidtchen, shop foreman, designed the toggle mechanism "A" to multiply the force of the press stroke.

Reinforced-steel bars are used to guide the motion of the insert holder "H" toward the tube clamp "C", which consists of two large steel blocks bored to accommodate the antenna sections. Four smaller toggles on the tube clamps are designed to force the blocks tighter and tighter





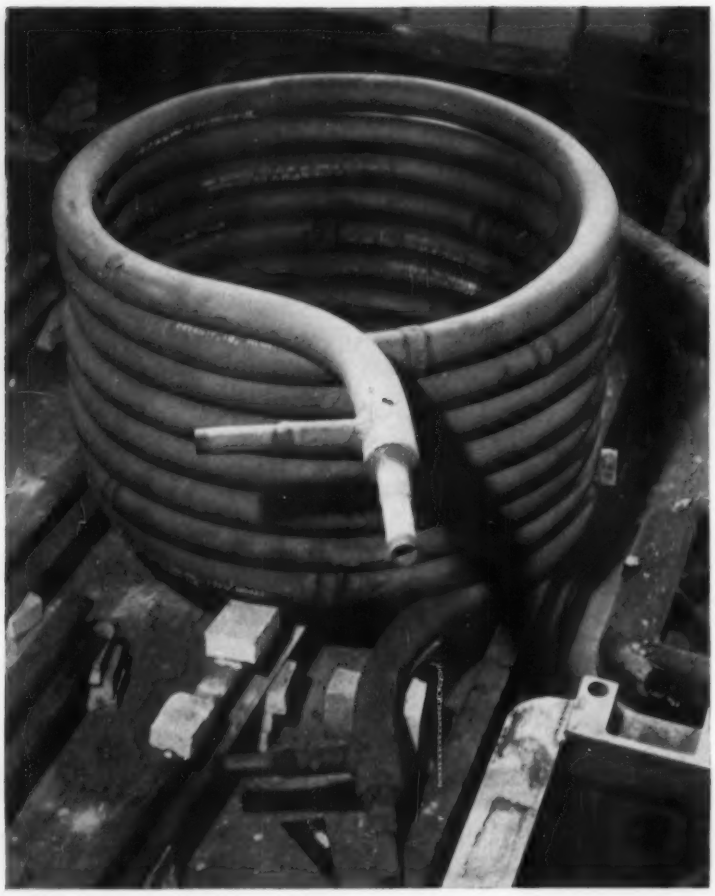
Master-plate jig boring . . .
can be done in either of two ways—by a pin on the table locating in holes in the plate or by pins attached under the plate locating in a bushing in the table. The choice is determined by the closeness of holes to be bored. In this setup, on a Bridgeport miller, parts are bored four at a time and tolerance is regularly held between 0.0003 and 0.0006 in. Thus, production load on precision jig borer is eased



together as pressure is applied to the tube. Also, this clamp distributes the pressure evenly over the tube surface; thus minimizes crushing and distortion. It needs no manual adjustment, but a different bronze bushing is used for each tube size.

Tube is Bonderized on the inside and covered with paper on the outside, the latter to prevent slipping and marring in the clamp. Bore is gun reamed and stainless steel coupling is centerless ground to provide an interference fit of 0.0015 to 0.002 in. Joints are pressed dry and production is 10 pc per hr joining both ends

"Press-brake" tooling . . .
is another timesaver on this versatile 125-ton inclinable press. However, it is necessary to beef up the ram-supported upper die to prevent the overhanging portion from flexing under load. Cabinet part (0.050-in.-thick CRS) is beaded in this setup after completion of all other operations. Control is better and output is much higher than when parts are individually made in sheet-metal shop, provided quantity on order warrants tooling. Most tools are CRS; will produce hundreds of pieces without trouble



Complicated coil assembly . . . for heat exchanger consists of sections of double tubing, one inside another, butt welded to form eight complete coils. Bending the sections is done cold with sand separating inner and outer tubes to maintain a uniform ¼-in. wall space within ± ⅛-in.

Cold bend coaxial tubing

Eight complete coils of two alloy tubes, one inside the other, are bent in sections and then joined. Sand is the secret

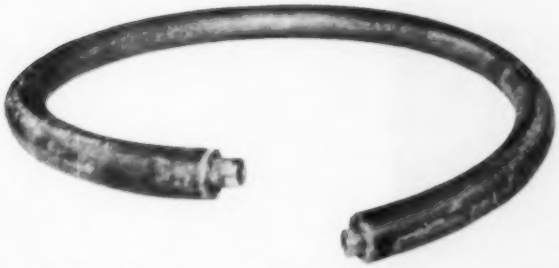
J P LE BLANC, chief engineer, TAYLOR ENGINEERING CORP, DETROIT

A heat-exchanger coil for carrying nitrogen and hydrogen through coaxial inner and outer coils was recently produced by Taylor Engineering Corp. The assembled coil had a mean diameter of 3 ft 10⅝ in. and was made up of eight coaxial sections butt welded together.

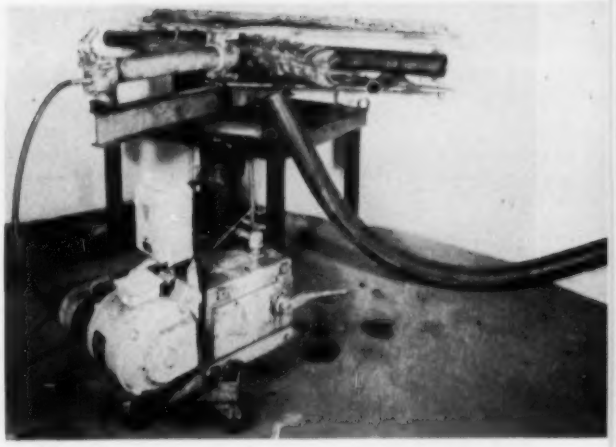
The outer tubing was 3¾-in. dia with a wall thickness of 0.563 in. Inner tubing was 2⅛-in. dia with a 0.313-in. wall. Both tubes were supplied in 12-ft lengths. Material was ASTM A-200-53 seamless alloy tubing grade T-3B, containing 2% chrome and 0.5% moly. The completed assembly operates under pressure of 1700 psi at temperatures ranging between 572 and 752 F. Welded joints and quality of the assembly had to be high. Test pressure, for example, was 3400 psi to check weld quality and bend strength.

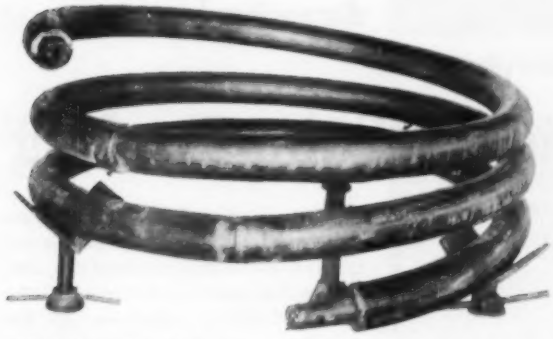
Inner and outer tubes were bent together in 12-ft sections using more or less conventional equipment, without heat or special pressures. Wall spacing was controlled by sand packed in each section. Ends of both inner and outer tubes were then cut with a powder-burning attachment on an oxy-acetylene cutting torch—the same method employed for producing holes for branch connections.

After bevelling the ends, butt welding was performed manually without special fixtures. To avoid thermal shock and strain, preheat temperature was maintained throughout welding and slow cooling and a furnace stress relief followed.

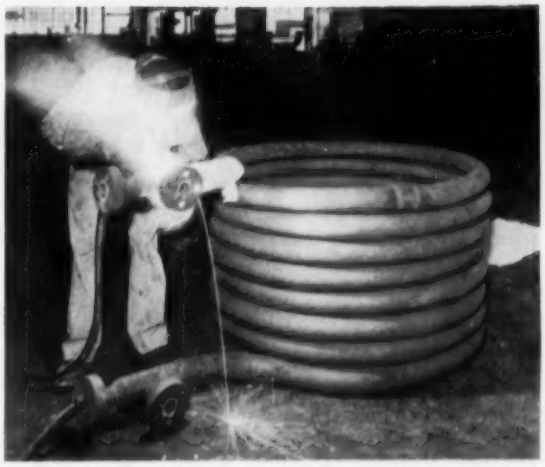


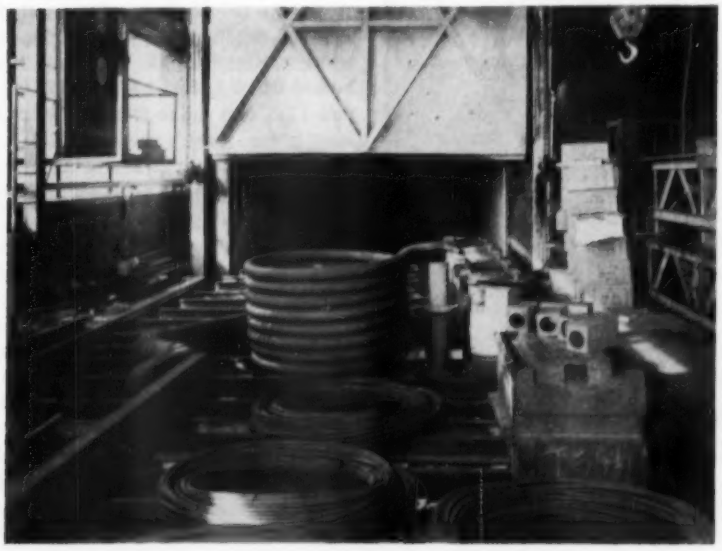
Cold-bending coaxial tubing . . .
is handled on a hydraulic-ram bender with a special bending shoe to produce a non-standard radius. One end of the double tubing is slightly elevated to produce the pitch required in the finished assembly. The tubes are bent progressively a short distance at a time until the complete radius is formed in the 12-ft length



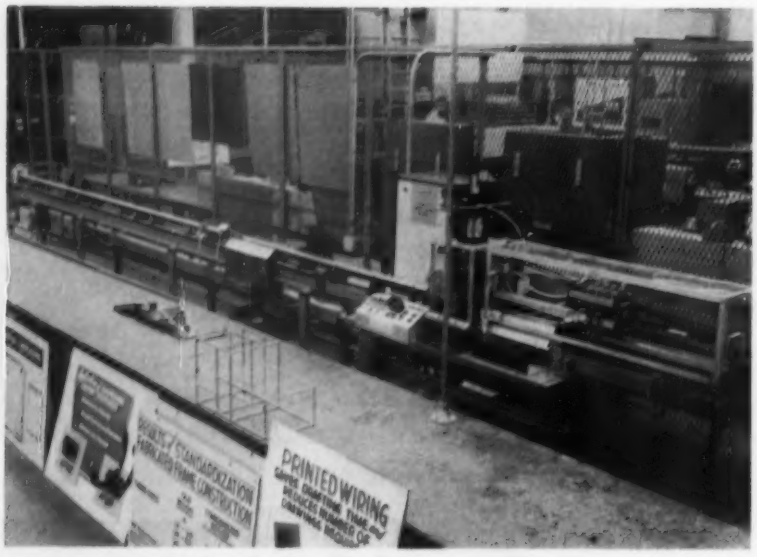


Welding is tricky . . .
requires sliding one section over another to position ends of inner and outer tubes in alignment with mating ends of the next section. Butt welds are made manually with coated rods on bevelled ends, starting with the inner tube, then joining the outer tube at the same end. Spacing between turns facilitates welding, coils are later closed up to complete the assembly. Nozzle and flange details are added last. Preheat temperature of 500 F is maintained throughout the operation and work is wrapped in asbestos after welding for slow cooling





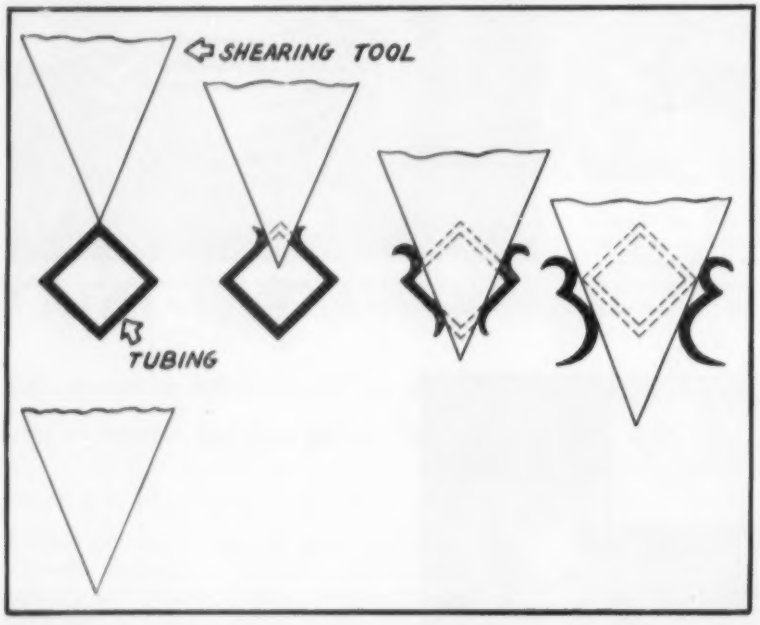
Final operation . . .
is a full furnace stress relief where temperature is gradually raised to 1375 F. Work soaks at this temperature for two hours, then drops at 50 F per hour to 600 F, finally is air cooled



Automatic cutoff machine developed at GE's Utica plant

● Automatic cutoff machine shears square tubing with no loss of tube's dimensional accuracy

Two Precision Tube Tooling



Unique cutting tool design . . .

permits clean, distortionless shearing of square tubing without using a mandrel inside the tube. About 0.1 in. of the material is sheared out in two pieces by the tool, which enters at a diagonal, pierces through, then pushes the sides outward simultaneously against the hardened edges of the dies through which the tubing passes. Dies are spaced apart the thickness of the shearing tool. Once the initial piercing is completed, further pressure on the tubing is outward, eliminating all deformation. At present, a carbide tool is used, but because it requires frequent resharpening, GE is experimenting with various shapes of ceramic tools to lengthen tool life without deforming the tubing during the initial piercing cut

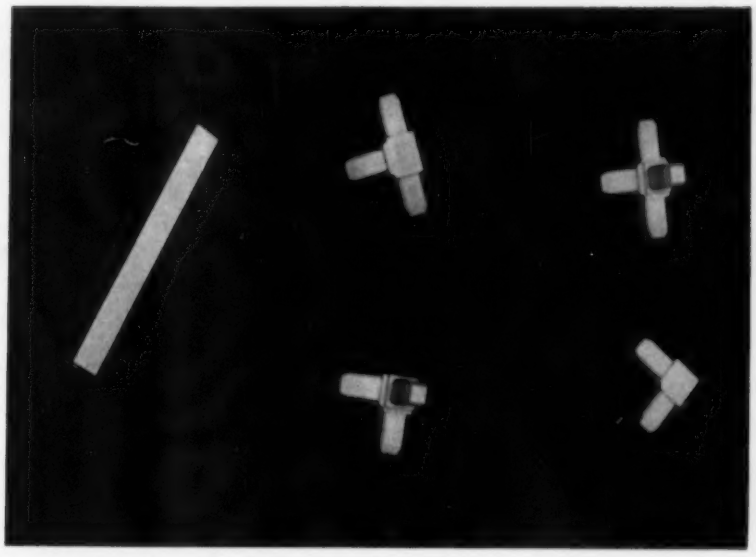
● Automatic shearing of seamless square tubing from raw stock is done so cleanly that no deburring is required and none of the initial 0.001-in. accuracy of dimensional control is lost, on a cut-off machine developed at General Electric's Light Military Electronic Equipment Department, Utica, NY. And changeover to a new cutting length requires just the time needed to flip toggle switches to new settings.

Here's how it operates: Raw stock up to 20 ft long is loaded into the machine's V-shaped input trough. Eight toggle switches, labelled 0.1, 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8, are set to totaled desired length (machine's range is 1.4 to 15 in.), a counter is set to number of pieces wanted, and start button is pushed.

New stock is advanced about ¾ in. past the shearing blade, and trim cut is made automatically to give a square working surface. Hydraulic positioner then brings stop mandrel to the desired position, tube advances to the mandrel stop, is sheared, and cut length is ejected into an output tray. Stock again advances and the cutting cycle is repeated.

Distortionless shearing without

● Cast corner fittings eliminate tubing welds on electronic equipment housing frames



Corner brackets and square tubes replace welds

Techniques

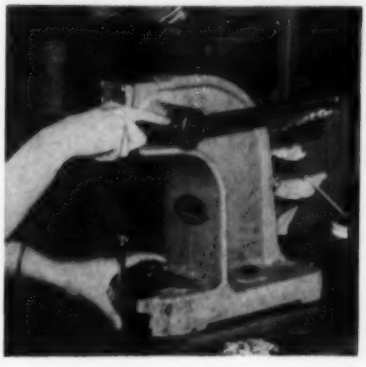
using a mandrel inside the tube is the result of unusual cutting tool design, shown at left.

Design of the machine's length-setting controls is such that the machine can be hooked directly to a punched-tape reader for automatic quantity-length control on short runs of various lengths.

As stock nears the end of a length, a snap-action switch is triggered if there isn't enough left for another piece, and machine signals operator to put in a new piece. Conversely, if the predetermined count runs out before the stock does, machine stops and waits for new orders, without retracting the stock.

●**Another tube-tooling technique** developed at GE's Utica plant eliminates welding of electronic equipment housing frames by substituting combinations of cast corner fittings and 0.3-in.-square chrome-molybdenum tubing cut to precise, specified length.

Using this new technique, an operator can assemble a complex frame shape and attach side panels to it in just about the same amount of time it formerly took to do the welding alone. Not only that, the



1 . . .

Operator holds tube in position on adjustable stop of arbor press in preparation for driving fitting into end of tubing

2 . . .

This is how the adjustable stop is inserted into holding fixture in the arbor press

3 . . .

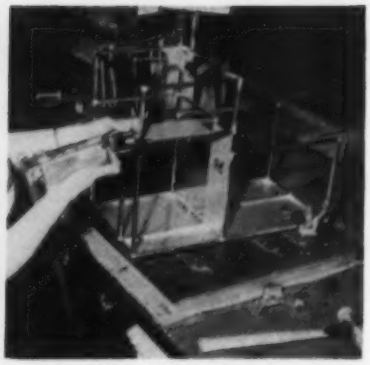
Fourth section of rectangular frame is assembled by tapping in the fittings alternately with a mallet

4 . . .

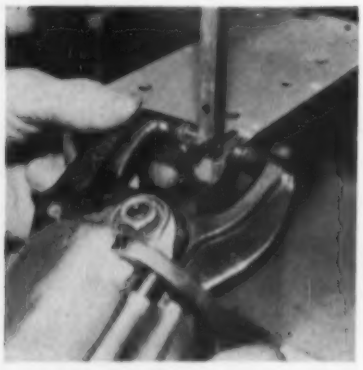
Crimping tubing over fitting with bench-mounted tool. Resulting joint withstands shock, vibration

Tube Tooling . . .

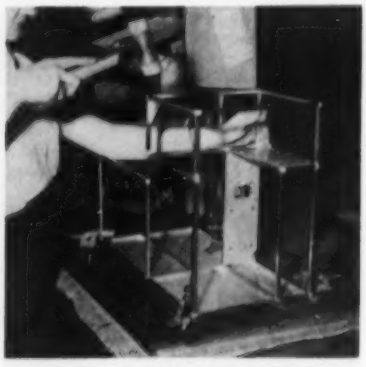
5 . . .
Frame is transferred to bed plate having hold-down clamps, then section held by operator is tapped into place



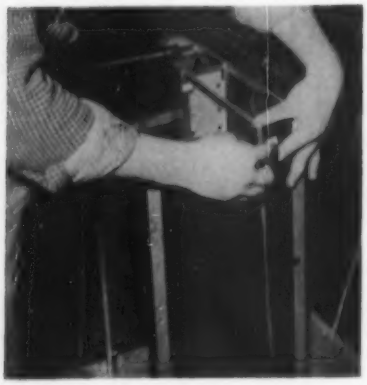
6 . . .
After section is tapped into place with a mallet, tubing of the completed frame is crimped with a hand-held tool



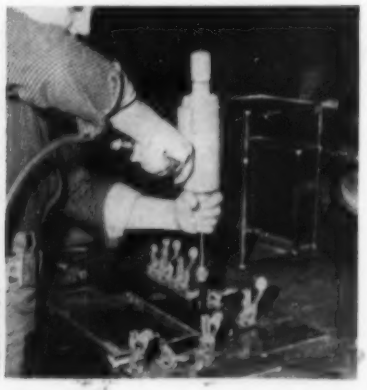
7 . . .
After crimping joint looks like this. Pivoted block on left jaw of tool is attached to washer for free rotation, allows precise positioning of dimple in center of tubing



8 . . .
Tapping final section of the frame into position. Interior panels are then riveted to frame sections before final assembly



9 . . .
Holding woven aluminum binding over tubing with masking tape in preparation for riveting panel into position on frame



10 . . .
Assembled frame is held by built-into-workbench fixture while Cherry rivets are used to attach the panel to frame

resulting frame requires no finish-grinding operations as in welding: it is strong enough to meet all specifications for military airborne electronic equipment housing: and it costs considerably less to produce.

A standard hand-operated press is used as much as possible to force the fittings into the ends of tubing before assembly. To do this, a metal fixture with adjustable stops is bolted to the press bed to accommodate varying lengths of tubing. The operator holds the tubing over the stop with the left hand, places a fitting on the upper end of the tubing in correct orientation with the right hand, then operates the press with the right hand to drive the fitting into the end of the tube.

When the assembly becomes too large or awkward for the press, the work is transferred to a heavy steel plate on the bench, where the fittings are tapped into place with a plastic-faced mallet. As each rectangular or other section of the final assembly is completed, ends of the tubing are locked into place over the fittings with an air-operated crimping tool mounted on the workbench.

As the frame reaches final shape, a portable version of the same type of tool completes the crimping. The crimper is a CP-214 compression riveting tool made by Chicago Pneumatic Tool Co. The hand-held unit is operated by a finger trigger; the bench unit by a pedal.

The assembled frame is placed in a bench-mounted jig, then panels are fastened one-by-one into position with a pneumatic riveter and Cherry rivets.

For panels needing extra-good r-f bonding and shielding, woven aluminum bonding strip goes over the tubing and is held in place with masking tape over ends that are run down the sides. After the panel is riveted, the tape is removed and the tab ends are cut off.

GE's Utica plant found that after an initial tooling cost of $6540 to make investment casting molds for the fittings, the fittings can now be made for around 20¢ apiece—a lot cheaper than the 50 special welding fixtures once needed to do the job. Eliminated, too, are the repetitive costs of grinding off welding flash and plating the entire frame.

American Machinist

SPECIAL REPORT NUMBER 433

✓ Checklist for press-tool design

G R TINDALE, methods engineer, KELVINATOR AUSTRALIA, LTD

Group No.	Function of Die	Related Factors and Section Numbers				
0	SETTING UP	0.1 Shop Layout and Equipment	0.2 Press	0.3 Die Cushion	0.4 Die	0.5 Setting Aids
1	LOADING & LOCATION OF WORK	1.1 Shop Layout	1.2 Loading Accessories	1.3 Nests and Locators	1.4 Strip Guides and Stops	1.5 Pilots
2	CUTTING OPERATIONS	2.1 Product Considerations	2.2 Blanking	2.3 Piercing	2.4 Notching and Trimming	2.5 Shaving
3	BENDING & FORMING OPERATIONS	3.1 Product Considerations	3.2 Bending	3.3 Forming	3.4 Curling	3.5 Rubber-Pad Work
4	DRAWING OPERATIONS	4.1 Product Considerations	4.2 Draw Punches	4.3 Draw Rings and Dies	4.4 Blank-Holders	4.5 Preparation of Blank
5	STRIPPING OF WORKPIECE AND SCRAP	5.1 Drop Through	5.2 Positive Knockouts	5.3 Fixed Strippers	5.4 Spring Strippers and Ejectors	5.5 Air Blast Ejection
6	ELIMINATION AND DISPOSAL OF SCRAP	6.1 Minimizing Scrap	6.2 Slugs	6.3 Scrap Cutters	6.4 Scrap Disposal Aids	6.5 Usage of Scrap
7	SAFE WORKING	7.1 Workpiece Protection	7.2 Die Protection	7.3 Press Protection	7.4 Press-Mounted Guards	7.5 Die-Mounted Guards
8	HANDLING AND STORAGE	8.1 Lifting	8.2 Movement	8.3 Storage	8.4 Loose Parts	8.5 Identification
9	MANUFACTURE AND MAINTENANCE	9.1 Materials	9.2 Manufacturing Facilities	9.3 Diemaking Practice	9.4 Provision for Sharpening	9.5 Provision for Repairs

Good die designs do not occur by accident. The experienced designer reviews his work periodically and when completed; the novice must think his way through and frequently use reference material available to him.

In either case it is helpful to have a checklist of the hundreds of questions that can properly be asked about the features and functioning of press tools. These have been coded in a master chart (this page). Under related factors are indicated the group and section number for the questions that arise from experience

COPYRIGHT 1956 BY McGRAW-HILL PUBLISHING CO INC, 330 W 42ND STREET, N Y 36, N Y

✓ Checklist for press-tool design . . .

0. *Setting-up the Die in Press*

0.1 *Shop Layout and Equipment*

Is there sufficient space around the press and in the aisles to permit ready transport of the die to and from the press?

Is a suitable crane or hoist available for heavy tools?

If the die is too heavy for the hoist, is it feasible to arrange for each half to be lifted separately into place?

If a portable loading table is used, can it be anchored to the press, so that it will not run away while the die is being slid into place?

Are suitable slings, chains, levers, wedges, clamps and bolts available for setting up and clamping the tool in the press?

Is compressed air available for air-blast ejection or die cushions?

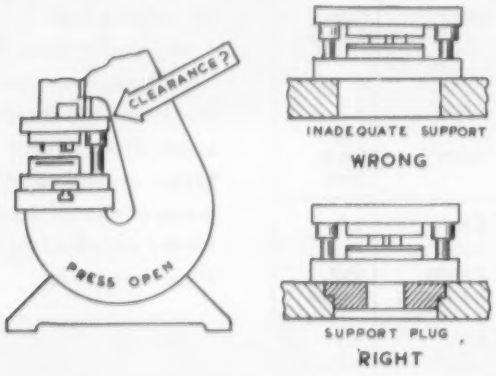
0.2 *Press*

Can the press exert enough pressure to perform the operation?

Has the press enough tonnage at mid-stroke for deep drawing jobs?

Is the speed of the press suitable for the work to be done?

Is the stroke of the ram long enough for the die to operate properly?



Has the press sufficient shut height to accommodate the die when closed?

Is there enough ram adjustment to insure that the die closes properly?

If not, is a suitable subplate available to increase the die height to press requirements?

If a gap-frame press is used, is the throat deep enough to take the die at the top of the stroke as well as at the bottom?

Are the ram and bolster plate large enough to accommodate the die?

Is the hole in the bolster plate too large for the die to be adequately supported?

If so, is a suitable plug or insert available?

Will the top shoe of the die clear the gibs or slide frame when the press opens up?

Is the knockout arrangement of the press suitable for the die?

Will the punch-holder shank fit into the hole in the ram?

0.3 *Die Cushion*

Is a pneumatic die cushion required?

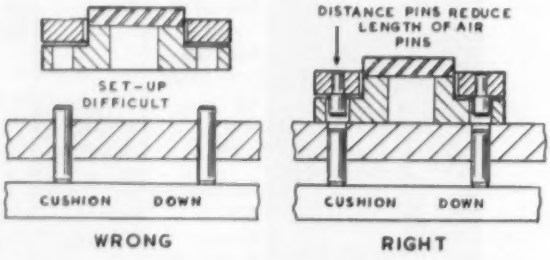
Has the available cushion enough stroke and tonnage?

Has the cushion enough area, and are the pressure-pin holes in the bolster plate suitably spaced?

Are there available sufficient pressure pins of the correct length and diameter?

Are their ends chamfered to minimize the effect of burrs?

Has the die been designed to use standard-length pressure pins?



Do the pressure pins protrude from the bolster plate when the cushion is lowered?

Can this condition be avoided by using shorter pins, and attaching blocks or pins to the die-pressure pad, to make up the difference in length?

If protruding pressure pins cannot be avoided, has the die been provided with tie straps, so that the complete tool may be lifted by the press ram to permit insertion and removal of skid strips under the die, when setting up and breaking down?

Is a rubber or spring-loaded die cushion required?

If so, is there sufficient space in the press bed, and is it readily accessible to the die setter when assembling and adjusting the cushion?

0.4 *Die*

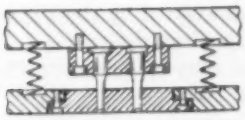
Do the clamping slots or holes in the die line up with the T-slots or holes in the ram and bolster plate? Some allowance must be made for misalignment because bolster plates are not always replaced accurately on presses after removal.

Has provision been made for enough clamp bolts of the correct diameter, especially if the die is heavy?

Is it possible to insert the clamp bolts when the die is in place in the press, thus avoiding the necessity of inserting the bolts first and then having to juggle the die into place?

Is it necessary to dismantle part of the die in order to set it up?

If so, are the fastenings easily accessible, and the mating parts provided with positive means of location?



INSERT IN HEAVY STRIPPER GIVES ACCESS TO PUNCHES FOR GROUP REMOVAL

If it is necessary to remove one or more punches for different jobs, can this be done while the die is in the press?

When several punches have to be taken out, is it possible to mount them in one punch pad for group removal?

Have dowels been spaced non-symmetrically to prevent incorrect replacement of punch pads?

If it is necessary to remove the spring-loaded stripper, can this be done easily?

Can the stripper screws be entered in their tapped holes when the springs are extended?

If the die is large and the stripper heavy, is it possible to include an easily removable insert in the stripper plate, so that punches may be removed through this opening?

If the stripper is rubber loaded, is it possible to avoid having rubber around the movable punches?

If not, has a separate small removable rubber pad been provided for them?

On dies which have no guide posts, has provision been made for easy removal or compression of stripper plates in order to line up the punch and die?

Have setting blocks or screws been provided to assist the die setter and prevent him from setting the die too deeply?

Are adjustable screws, stops and stock locators easily accessible when the tool is in the press?

Can air-hose connections be readily made for ejection, etc.?

Has it been considered that the die setter may have to set up the die and make his adjustments on night shift, with inadequate lighting and lack of skilled assistance, so that he needs easy accessibility and adequate wrench space for all removable or adjustable parts?

0.5 *Setting Aids*

Should the tool be branded with any warning notice or special instructions?

Would a sample part or strip be useful to the die setter?

Could center lines be permanently scribed on the die and bolster plate to insure correct alignment of air pressure pins?

Where different parts are to be produced in one die by:

(a) Removable punches
(b) Variations in depth of ram setting
(c) Adjustable stops or locations

have steps been taken to identify clearly the combinations required?

Is it desirable to provide a set-up card or sheet showing:

(a) Name or number of press for which die is designed
(b) Tonnage required for operation
(c) Air-pressure pin length and spacing diagram
(d) Air-cushion gage pressure
(e) Shut height of die
(f) Strip width
(g) Knockout setting
(h) Any other set-up instructions

Is it necessary to brand the front of the die to assist in setting up?

1. *Stock Loading and Location*

1.1 *Shop Layout*

Is there ample room for coil cradles, stock straightening rolls, outrigger supports, or other auxiliary equipment?

Are there suitable areas for storage of workpieces before and after the press operation?

If a group of presses is to be set up on a flow-line basis, is it desirable to install conveyors between the presses?

1.2 *Loading Accessories*

Is the volume of work sufficient to warrant the use of special stock-feeding equipment?

Which, if any, of the following arrangements would be most effective:

(a) Roll, hitch or hook feed for strip stock
(b) Dial, hopper or magazine feed for blanks or semi-formed parts?

Is the press capable of operating such a mechanism effectively, or should it be power driven?

Has the die been designed to allow the stock to pass through it in the same direction as that required by the feeding mechanism?

Are the dies clear of the work for a long enough time to allow the feeding device to operate without the stock fouling on long punches or pilots?

Has provision been made to allow feed variations to be corrected by pilots, the stock being free to align itself as the pilots enter it?

Will the efficiency of the feeding device be affected by rough edges or variations in stock width or thickness?

Will lubrication of stock cause feed sticking or slipping?

Have steps been taken to insure that no slugs, blanks etc., can stick on the punches or in the dies, thus causing damage to dies or feeding mechanism?

Will straightening rolls be required?

Should the operator be provided with special tongs or pliers for loading the work?

Would a vacuum-cup pick-up be useful?

Have magnetic separators or "floaters" been considered as a means of separating stacked blanks, for easier handling?

1.3 *Nests and Locators*

Is the blank or part positively located?

Can fouling pins or similar devices be used to pre-

vent incorrect loading of the blank into the die?

Are the locators adjustable to compensate for wear?

Is it necessary to provide some spring-loaded locators to accommodate variations in blank size?

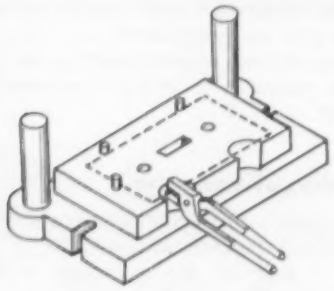
Are the locators clear of the punches, strippers or other moving parts when the die closes?

Will the press operation distort the stock and make it stick in the locators?

In shaving dies, have the stock nests been raised from the die face or relieved underneath to avoid fouling by chips?

Would movable or pivoting nests be more suitable than fixed locators on a shaving die?

Have suitable clamps or pressure pads been included to insure that formed parts are securely held in, or on, their locators during the press stroke?



CLEARANCE HOLES FOR LOADING TONGS

Are there suitable finger-clearance holes or slots to assist the operator when inserting or removing the workpiece?

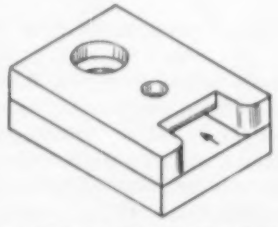
Has the die been designed for easy loading, in accordance with motion-study recommendations?

On draw dies, does the design permit the blank locators to be adjusted by the tryout man?

1.4 *Strip Guides and Stops*

Is there sufficient clearance in strip guides to accommodate normal variations in width and thickness of the stock?

Will burrs raised by piercing punches cause stock to stick in strip guides?



MOUTH OF STRIP GUIDE RADIUSED FOR EASY INSERTION OF STOCK

Are strip guides long enough to give adequate guidance to the stock before the first stage?

Has the entrance of the strip guides been chamfered or radiused to permit easier insertion of new strip?

Are stock pushers required to keep the strip aligned against the gaging side of the guides?

Is the pressure exerted by the stock pushers sufficient to make feeding difficult?

If so, should a cam-relieving device be employed to free the strip from pressure while feeding takes place?

If staging is accomplished by notching the edge of the strip for a stage length, has the notching punch been placed on the opposite side of the strip to the gaging guide?

Are the finger stops for starting the strip properly located, and is it possible to avoid cutting on one side only of the punch at the first stage?

When the finger stops are pushed in, will they foul the punches?

Do the finger stops need hook wires attached so that they can be operated through the bars of the press guard?

Is it possible to arrange the stops so that the first blank may be used?

Can the die be laid out to use the stock right to the end of the strip?

Have all the stops been located to allow the pilots to pull the stock back about 0.010 in., to avoid crowding by burrs or dirt?

If a trigger-type automatic stop is used, will the gaging end lift before the punches begin to enter the stock? This fault may be avoided by insuring that the lever arm of the striker end is shorter than that of the gaging end.

Are there any stock projections to foul the trigger stop or holes into which it may drop and prevent the proper staging length being fed?

When cropping off thick material, has the stop been spring loaded in order to avoid damage by stock crowding between the punch and the stop?

When the strip has to be run through the die twice, can a stock pusher be located for use as sprung locator on the second run, by dropping into notches cut in the strip edge during the first run?

If a sighting stop is essential, can it be seen easily with the press guard in place?

1.5 *Pilots*

Is it possible to pierce suitable holes in the first stage so that two pilots may be used in the second stage?

If no pilot holes are permissible in the blank, can they be pierced in that part of the strip which will become scrap?

Have pilot holes in the die been drilled right through to allow for slugs caused by a misfeed?

If pilots are thin, can they be supported by bushings in the stripper plate?

If pilots are inserted in the face of the blanking punch, has the parallel portion of the piloting diameter been kept as short as possible, to reduce likelihood of the blank sticking on the punch?

Are all pilots readily removable for punch sharpening?

Are the pilots long enough to locate the stock before any other punches or pressure pads commence to operate?

Would it be advantageous to make one of the pilots of "diamond" section?

If stock is heavy, will it be necessary to use spring-loaded pilots? Avoid them if possible.

Are pilot holes as far apart as possible for effective location?

2. *Cutting Operations*

2.1 *Product considerations*

Does it matter on which side of the blank the burr appears?

Does the grain of the material need to bear any special relationship to the profile of the blank?

Is a compound die necessary to produce the dimensional accuracy and flatness required?

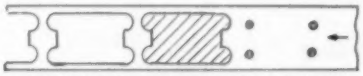
Does the finish of the edges call for a shaving operation?

If the blank is to be formed or drawn, has the form die or forming section of the progressive die been made first in order to permit development of the blank shape by trial?

Has the die layout been checked to insure that it will not produce a laterally inverted or "mirror" image of the part required?

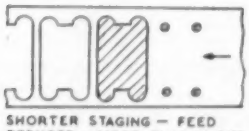
2.2 *Blanking*

Has the die been designed to give the shortest practicable staging length?



LONG STAGING – LESS BLANKS PER STRIP

WRONG



SHORTER STAGING – FEED REDUCED – MORE BLANKS PER STRIP

RIGHT

Is the die shape readily machinable in a solid die block?

Do shape or strength considerations warrant the use of inserts or sectional dies?

If so, are the sections firmly keyed to, or inserted in, a solid base?

Do size considerations warrant the use of composite die sections?

Is it desirable to hold the blank by a spring- or air-loaded pressure pad, to maintain flatness?

Can the blanking load be relieved by grinding shear on the die?

Can the break-through shock of heavy blanking be absorbed by the die cushion?

Would it be advisable to produce some sections of the blank profile by earlier piercing or notching stages in the die?

If part of the profile is to be shaved, could this be done in similar fashion, or by earlier stages prior to final blanking?

Is the scrap bridge between blanks wide enough? It should be at least equal to metal thickness, but not less than 1/16 in. wide.

If the strip is to be run through the die twice, will distortion, caused by blanking in the first run, interfere with the free feeding of the stock in the second run?

2.3 *Piercing*

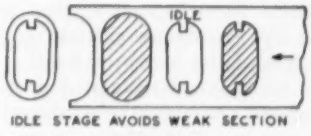
Are the holes large enough to be pierced? The hole diameter should normally not be less than stock thickness.

Have small-diameter punches been kept as short as possible?

Is it desirable to support small-diameter punches by bushings in the stripper plate?

WEAK DIE SECTION BETWEEN HOLES

WRONG



IDLE STAGE AVOIDS WEAK SECTION

RIGHT

Are quills necessary for holding small punches?

Do the punch heads need hardened backing plates behind them?

Where small punches are close to large ones, have they been stepped to strike later, in order to avoid crowding by stock distorted during penetration by the large punch?

Are the holes in the stock too close to each other to be pierced in one stage?

Do strength considerations in the die block necessitate an idle stage between piercing and blanking operations?

Have all non-circular punches and die buttons been keyed against rotation?

Is it necessary to step punches to reduce piercing tonnage?

Has shear been ground on punches for long slots?

Is the punch pad thick enough to give adequate support to the punches?

Has correct clearance been allowed between the punches and dies?

2.4 *Notching and Trimming*

Have suitable heel blocks been provided to back up the notching punches?

Is it possible to avoid using heel blocks by providing heels on the punches themselves, thus allowing the thrust to be taken by holes in the die block?

Where identical notches occur on opposite sides of a narrow strip, can a bridge-type notching punch be used; the balanced load making heels unnecessary?

Where half holes occur when starting a strip, can notching thrust be resisted by guiding the punch

in the stripper? Or can you use some other method?

When trimming the edges of blanks or flanges of drawn parts, is it desirable to provide scrap cutters?

In trimming drawn shells, does the nature of the work favor "pinch trimming"?

Would an expanding, sectional trimming punch, working from inside the shell, be more effective?

Does the operation call for a "shimmy die"?

When notching or trimming corners from a blank, has the notched profile been designed to cross the edge of the blank at a great enough angle to avoid cutting thin slivers of metal, which damage the punch and die by "rolling" between them?

Can trimming be combined with flanging and/or piercing?

2.5 *Shaving*

Will two shaves be required to produce the accuracy required, or will one suffice?

Has the correct amount for shaving (6% to 10% of stock thickness on each side) been allowed on the edges of the blank?

Has the blank been located so that the shaving punch or die will commence cutting on the smooth or sheared edge of the blank or hole?

If both the holes and outside contour of blank require shaving, can the blank be produced in a compound die, to insure that all the burrs are on the same side?

What provision has been made for removal of chips?

Are scrap cutters desirable to break the pile up of scrap rings on the punch?

Is the shaved blank likely to have its edges damaged by falling into a container when pushed through the die?

If so, would it be desirable to invert the die and locate the blank on the lower punch by pilots or spring-loaded nests?

Has it been remembered that stripping pressure is very high in shaving dies, and that positive knockouts or air cushions should be used in preference to springs for ejecting the blank?

Where part of the outside contour of the blank requires shaving, have suitable back-up plates been provided?

Have these plates been recessed into the die block, or firmly keyed to it?

Have the shaving punches been provided with heels?

Where shaving is necessary on part of the edge of a blank, is it advisable to leave a shaving tab on the opposite side, so that the thrust may be balanced by the opposing cut?

Has the clearance between punch and die been kept to a minimum?

Can the die be made of sectional design, to permit grinding its profile?

Have the guide posts been located on the centerline, or diagonally across the die block to insure accurate guidance?

Is it desirable to secure the upper member to the press ram with a floating adapter, to avoid misalignment?

3. *Bending and Forming*

3.1 *Product considerations*

Is the material ductile enough to be formed to the shape required?

Will the metal deform sufficiently to allow stretch or shrink flanges to be produced?

Can the bends be arranged to lie across the grain of the material?

Is the inside radius of the bend large enough to avoid cracking the material?

Are the holes far enough from the bends to avoid distortion?

Will distortion of the blank, caused by embossing, affect the function of the product?

Can the bending operations be combined with cutting off?

Does the product lend itself to forming by the Guerin rubber-pad process?

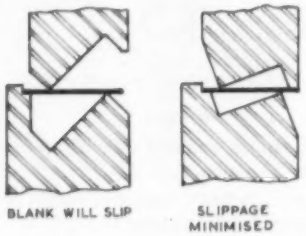
Has it been recalled that rubber-pad work is usually more economical on parts of large dimensions than on small ones?

3.2 *Bending*

Are the product tolerances wide enough to allow bending in a V-die?

If so, has clearance been allowed for the legs of the bend to "fly" into their new position?

Will an "air bend" die suffice?



If a double V-bend or similar complex form is to be made, has the tool been designed to allow two of the prominent points on the punch to strike the stock simultaneously in order to minimize slippage?

Are pointer or serrated grippers needed to reduce slippage?

If so, will their marks affect the function or appearance of the product?

Is it possible to get the formed part off the punch or out of the die?

Does the accuracy of the bend require the use of a spring pad or "wipe" die?

Are the springs strong enough to prevent slippage?

Is the wiping punch backed up with a heel?

Have the bend allowances been calculated correctly?

Has allowance been made for spring back?

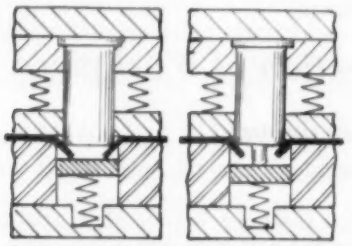
Will any bent or formed projection interfere with stock feed or with subsequent stages in a progressive die?

In a progressive die, is it better to bend the legs down or to slide the strip up a spring-loaded cramp and form them up?

3.3 *Forming*

If the form is simple one of small dimensions, can it be combined with blanking, by contouring the face of the blanking punch?

If cam-operated slides are required for forming, will they need positive return surfaces on the cams, or will springs alone suffice?



Should the ejector be depressed in advance of the forming punch to avoid fouling the flange or extrusion while it is being formed?

Would a swinging or "rocker" punch be useful for an undercut form?

If piercing be combined with countersinking, embossing or extruding, has provision been made for disposal of the slug?

Does the form need "spanking" to insure a permanent set?

Does the form require a "tangent bender" operation?

Does the forming punch require a heel or back-up block?

3.4 *Curling*

If curling is to be done, is the curl radius large enough, say, more than 25 times metal thickness?

Is the diameter of the curled or wired rim large enough, say, more than 25 times metal thickness?

Is the burr edge of the work on the inside of the curl to minimize die wear and make the start of the curl easier?

Are the shell walls amply supported against collapsing?

3.5 *Rubber Pad Work*

Is the thickness of the rubber pad at least 4 or 5 times its vertical displacement over the form blocks?

Is the rubber effectively confined in a pressure container strong enough to withstand the "hydraulic" pressure involved?

Is the press able to exert from 1 to 2 tons per sq in. over the rubber surface?

Will the tools distort under the high pressure of the rubber?

Are the flanges wide enough (at least 3 times the metal thickness) to be formed effectively?

If flanges are narrow, have the bend radii been kept to a minimum?

Are the form blocks at least ¼ in. deeper than the flange width?

Can the form be produced over a projection rather than into a recess?

Does the blank need a pressure pad over it, to prevent buckling of the flat area?

Can the rubber be trapped under the flange and thus be torn on retracting?

Are ironing plates required to prevent wrinkles in shrink flanges?

If blanking or shearing is to be done, is the scrap allowance sufficient, say ¾-in. margin on the blank?

Is the metal thin enough (less than 0.040 in.) to blank?

If piercing, are the holes large enough to apply sufficient pressure? (The area available is equal to a strip from ⅛ to ⅜ in. wide, along the line of cut).

4. *Drawing Operations*

4.1 *Product Considerations*

Is the material ductile enough for drawing?

Will it need annealing between redraws?

Will the normal thickness variations in the drawn shell be permissible?

Does the shell need ironing to maintain size in wall thickness?

Are the radii in the bottom corners of the shell or the flange neck so small as to require a re-strike operation after drawing?

How many redraws will be needed to bring the shell to finished size?

Is it necessary to retain a flange or can the shell be pushed through the die?

If pushed through the die, will the top of the shell need trimming to remove "ears" or irregular edges?

If the flange is to be trimmed off, has the shell been drawn deep enough to trim it below the draw radius?

In calculating this depth, has allowance been made for loss of depth through re-surfacing the blank-holding face of the die?

If the shell bottom requires piercing, indenting, embossing etc., can these operations be performed in the draw die?

Could such operation be assisted by previously piercing suitable holes in the blank?

Would it be better to preform these features in the blank with a separate die, prior to drawing the sides of the shell?

Would it be advantageous to draw the shell with a concave bottom, and then, in a second die, force this "hump" into the contour required?

If the shell is tapered, and not deeper than 1½

times its diameter, has reverse drawing been considered?

4.2 *Draw Punches*

Is the punch-nose radius large enough to prevent shell breakage in the draw and successive redraw operations?

Is it possible to taper the punch slightly to assist in stripping?

Have air-vent holes been drilled through the punch?

If the die will not draw the shell quite deep enough, would it be an advantage to provide a shallow, sharp shoulder around the punch to bite into the shell wall, and ease the load on the bottom corners?

Has the draw punch been polished longitudinally?

In the drawing stages of progressive dies, has provision been made for shear pins or other safety devices to free the punches in the event of two blanks accidentally entering the die?

If a pinch trim is included in the operation, has the punch been constructed to permit easy sharpening of the trimming shoulder?

4.3 *Draw Rings and Dies*

Is the draw radius correctly proportioned to the metal thickness?

Is the blank-holding area of the die large enough to allow for modifications in the blank size or shape?

Is it likely that excess material may be required on some parts of the blank in order to restrain metal flow?

Has the clearance between punch and die been increased at the corners of rectangular shapes?

Would it be advantageous to have curved or angular surfaces on the die face and blank holder?

If the die face is at an angle to the horizontal, has some form of buttress or drift lug been provided to restrain the blank holder from sliding out of alignment?

Has the die been designed with airvent holes?

If the die is a push-through type, has the lower surface been chamfered to give a sharp edge around the hole in order to assist in stripping?

If the product is of stainless steel, has consideration been given to the use of suitable bronze, instead of hardened steel, for the die ring?

Is the product material likely to "load" the die rings or blankholders?

4.4 *Blankholders*

Is a blankholder necessary to hold the stock while drawing takes place?

If so, can the springs or air cushion exert enough pressure to prevent wrinkles in the product?

Are draw beads required to restrain the metal flow?

Has the blankholder stroke been limited to prevent it bouncing or jumping off the air-cushion pins as it comes to the top of its stroke?

Is it desirable to have pressure strips, slightly thicker than the stock, on the face of the blankholder outside the blank area, in order to minimize the frictional drag on the stock?

Have the blank holder and die faces been polished, especially when drawing aluminum?

4.5 *Preparation of Blank*

Have the blanks of deep shells been kept as small as possible, especially around the corners of rectangular shapes?

Will the blank need to be "break rolled" or roller leveled before drawing?

Will it need pickling to remove scale?

Has the correct lubricant been selected for drawing?

What means have been devised for coating the blank with lubricant?

Should the blank be coated with tin, copper, plastic or phosphate in order to prevent galling or erosion of dies?

5. *Ejection of Workpiece*

5.1 *Drop through*

Is it possible to push the finished part through the die?

If so, has the press bolster plate a large enough hole to let the part through?

Where the parts cannot go through the bolster plate, is it possible to raise the die on subplates to permit "push through" delivery?

Will the underside of the die need stripper fingers or rings to strip the part from the punch?

Can chutes or dividing strips be used to separate the parts from the scrap?

Can blanks with holes in them be arranged to thread themselves onto pointed rods, suitably fixed at the other end, thus becoming aligned and stacked for a following operation?

Where compound dies push the blank back into the strip, is it necessary to separate the blanks by sliding the strip over a suitably sized hole beneath a rubber roller?

5.2 *Positive Knockouts*

Is it desirable to carry the finished part up on a punch or in a die in the top tool, and eject it with a positive knockout at the top of the stroke?

Has the knockout sufficient stroke to do this?

Can a swinging chute or blank catcher be used to receive the part as it is knocked out?

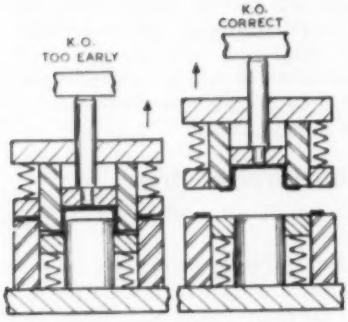
Will the knockout distort the part?

Is a simple central knockout sufficient, or does it need a "spider" to distribute its force more evenly over the blank?

Does the knockout need spring loading to keep it inactive until the press comes to the top of its stroke?

When a positive knockout is used in an inclined press, will the part have time to drop away properly before the next stroke takes place?

If the press is not equipped with a knockout, is it possible to operate one with suitable bolts or chains attached to the lower die shoe?



PART WILL BE DAMAGED, OR EJECTION PREVENTED, IF KNOCKOUT IS SET TOO EARLY

Does the knockout rod need an adjusting screw in its upper end to permit use in several presses?

Where a positive knockout in the top tool is used in conjunction with a spring ejector in the lower tool, has the knockout action been delayed long enough to allow the ejector to finish its work first?

5.3 *Fixed Strippers*

Are the product tolerances wide enough to permit the use of a fixed stripper?

Is the stock thickness and consequent stripping force great enough to make a fixed stripper essential?

Is the stripper plate strong enough to resist bending under the stripping load?

Where the blank must be returned into the strip and carried along to the next stage, has the height of the stripper above the die face been kept less than twice stock thickness, in order to prevent the stock riding over the top of the blank?

Where the underside of the stripper plate has been stepped to provide starting stops for new strip, has this fact been plainly marked so that the operator will be reminded of it?

Can the stripper plate be removed without taking the die out of the press?

On formed work, are "skyhook" strippers desirable for stripping the work from the punch?

Will they seriously mark or damage the work?

5.4 *Spring Strippers and Ejectors*

Does the accuracy or flatness of the product require the use of a spring stripper?

Are the springs strong enough to overcome the stripping load?

Would rubber be more suitable than springs for loading the stripper?

Is it desirable to use air cylinders or diaphragms to provide stripping force?

If the stripper should stick, are all the parts strong enough to withstand the shock of a sudden release?

Is the stripper plate a loose fit on the punches and able to rock a little without sticking, when uneven stock or burrs are encountered?

Where slender punches need guiding in the stripper plate, no rocking can be permitted. In this case, have suitable guide strips or pins and bushings been provided to maintain the stripper in alignment?

Have you read the notes on setting up dies with spring strippers? (Refer to Section 0.4).

If blanking punches are equipped with spring-loaded push-off pins, are these readily removable, and would punch sharpening affect their replacement?

Where a spring stripper is used to strip channels from a form punch, have arrangements been made to depress the stripper soon enough to avoid the legs of the bends fouling on it as they are wiped up the sides of the punch?

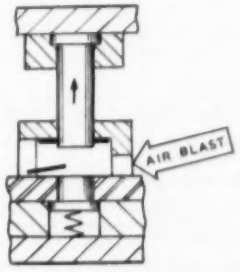
In double-action draw dies, has the action of the ejector been delayed long enough to allow the blank holder to rise out of the way before the shell is pushed out?

5.5 *Air Blast Ejection*

Can the parts be ejected from the press by a suitably directed air jet?

If so, have the position of the nozzle and the timing of the blast been made adjustable, to provide the best operating conditions?

If no air line is available, can a suitable pump cylinder, operated by the press, be installed?



ELEVATED FIXED STRIPPER AND AIR BLAST FOR BLANK DISPOSAL

Where the blank is returned to the die face by an ejector in the lower tool, can an elevated fixed stripper be used to allow the punch to lift the strip clear, while an air blast ejects the blank prior to the delayed stripping?

Have suitable chutes or containers been provided to catch the blown-off parts?

Where blanks or parts are inclined to stick on punches or in die cavities, can they be blown free by air passing through drilled passages in the punch or die?

6. *Elimination and Disposal of Scrap*

6.1 *Minimizing Scrap*

Does the shape of the blank permit economical stock usage?

If not, can the shape be altered to allow blanks to nest into each other in the strip layout?

Could the part be produced by a pierce and cut-off sequence, avoiding wasted material in scrap bridges between blanks?

If large and small parts are required in equal

numbers, is it feasible to produce them in the same die, the smaller parts being blanked from material subsequently cut from the center or edge of the large piece?

Can the scrap percentage be reduced by setting the blanks at an angle across the strip?

Can stock economy be achieved by double-row alternate blanking?

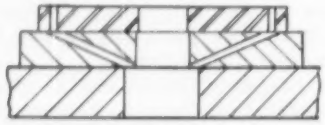
6.2 *Slugs*

Has taper relief been given to the slug holes in the die block?

Are the slug holes in the die block and lower shoe clean, smooth and without ridges or steps to impede the flow of slugs?

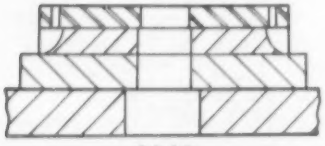
Can the slugs pass through the hole in the press bolster plate?

If the slugs cannot pass through the bolster plate, can the die be packed up to take a slug tray underneath?



POOR

SLUGS TEND STICK IN INCLINED PASSAGES



GOOD

SLUGS SLIDE OUT EASILY THROUGH SHORT SLOTS IN DIE PACKER

Would it be desirable to use blocks between the die block and the lower shoe and allow the slugs to slide out on ramps?

Are ramp angles steep enough to prevent slugs sticking?

Have air-cushion pin holes been shielded against entry of slugs?

Do the faces of the piercing punches need shaping to prevent their pulling up the slugs?

Would it be advantageous to bellmouth the die holes to insure that slugs stay down?

Can the slugs be led away through suitable tubes to separate them from the blanks?

When piercing upwards, can the slugs be directed to a position where they will not fall into the die?

6.3 *Scrap Cutters*

Is it desirable to add scrap cutters to trimming punches, rather than to use strippers?

Is the shape of the severed scrap such that it will readily clear itself from the punch?

Will the severed scrap fall into and foul any part of the die?

Would it be an advantage to split the scrap ring in one place and lead it, by means of curved shoulders on the punch, onto a disposal horn, from which it can be ejected at the back of the die? (*AM* —Dec '54, p175).

Is it advisable to add a scrap-cutting stage into strip-feed dies in order to eliminate handling long lengths of flimsy scrap?

6.4 *Scrap Disposal Aids*

Is the tool designed to allow the scrap to fall away easily?

Will scrap, falling to the rear, be caught on the guide pillars?

Has the die been drilled and tapped to take standard scrap chutes?

Is a mechanical lever or kicker necessary to knock the scrap away?

Should the operator be provided with a scrap rake?

Is the scrap produced in sufficient quantity to warrant installation of conveyors and scrap-baling equipment?

6.5 *Usage of Scrap*

Is it economical to blank smaller parts from pieces of scrap?

Can round slugs be made into useful washers by adding a previous piercing stage into the die which produces them?

Can slugs be used to assist in deburring or polishing articles in tumbling barrels?

7. *Safe Working*

7.1 *Workpiece Protection*

Will workpieces be damaged by "drop through" or air-blast ejection?

Have stripping or ejecting mechanisms been checked to insure that they do not damage the product?

Is it necessary to provide special containers or racks for workpieces?

Would it be advisable to coat, with protective paper or plastic, easily scratched materials?

On press brakes, has a rubber buffer strip been secured to the front of the press to prevent damage to panels which fly up and strike the ram when bent in V-dies?

7.2 *Die Protection*

Are all die parts strong enough to withstand the stresses and shocks of normal operation?

Is it necessary to support form punches or dies on shear plates, which will give way, and save vital parts from damage, if overloaded by the insertion of more than one workpiece?

Have suitable shields or guards been provided to protect important mechanisms from damage by intrusive slugs or scraps?

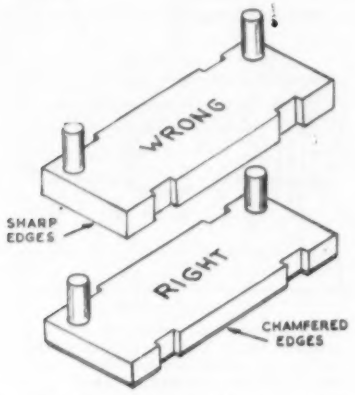
Will the die be damaged if the operator oversets the knockout?

Is it necessary to use non-symmetrical spacing or unequal diameters of guide posts to prevent incorrect assembly of the die?

Is it necessary to use limit switches, connected with electrical controls for the press tripping mechanism, to protect the die from incorrect loading or feeding?

7.3 *Press Protection*

Have the edges of the die set been chamfered to minimize damage to the press bolster plate from sharp corners?



Has the press been fitted with an overload pitman device or an overload relief bed?

Is it necessary to protect the press by means of safety devices built into the die?

When the die is closed, will the top of the guide posts be below the top of the punch holder?

Has a suitable warning device been installed to direct attention to a serious drop in air pressure?

7.4 *Press-Mounted Guards*

Has the press been equipped with a suitable guard?

If the guard is one of the cage type, have the bars been arranged vertically to avoid eye-strain?

Is it possible for the operator to see clearly all the stops and other important die details with the guard in place?

Is it possible for the operator to get his fingers into danger under, over or around the back of the guard?

Would a sweep guard be preferable to a cage type?

Where no guard is possible, has the operator been protected by a two-handed tripping mechanism?

On large presses, have safety blocks been provided to prevent accidental descent of the ram while men are working in the press?

7.5 *Die-Mounted Guards*

Are the stripper-plate spacers high enough to give plenty of finger clearance?

Have sheet-metal guards been built around spring- or cushion-loaded blank holders and stripper plates to prevent fingers, wrenches, etc., getting under them?

On long stroke presses, where guide posts and bushings become disengaged, have the posts been inclosed with suitable springs attached to top and bottom tools to form "concertina" guards?

8. *Handling and Storage*

8.1 *Lifting*

Have chain slots been provided in the die set?

Have lifting lugs, pins or rods been included in the design of heavy tools?

Are there tapped holes for eyebolts in all heavy individual die parts?

Is it desirable to brand heavy tools with their weight?

8.2 *Movement*

Does the die need tie straps or bolts to prevent it from falling apart when moved from place to place?

8.3 *Storage*

In many cases, heavy press tools are stacked one on top of another. Have "bump" blocks been provided, properly positioned, to avoid bending of guide posts or damage to the die in storage?

Where a protruding part of a tool prevents orderly stacking, is it practicable to make it easily detachable for tidier storage?

8.4 *Loose Parts*

Where loose parts, such as alternative locators, etc. are required, can their loss be prevented by securing them to the dieset with screws or chains?

8.5 *Identification*

Has the die, and all loose parts belonging to it, been branded clearly with identification numbers or symbols?

Would it be advantageous to paint, with a distinctive color, all the tools for one project?

9. *Manufacture and Repair*

9.1 *Materials*

Have standard die sets, stripper bolts, springs, dowels and other readily purchasable parts been specified wherever possible?

Has the designer specified materials which are best suited for the tasks they have to perform?

Has the correct heat treatment been specified for all stressed parts?

Are the materials of stock size and readily available?

9.2 *Manufacturing Facilities*

Are the necessary toolmaking skill and equipment available?

Can dies and parts thereof be proportioned to suit the machines in the shop, rather than have them sent outside for manufacture and maintenance?

Are the heat-treated parts within the capacity of available furnaces or salt baths?

Have the alternatives of casting or fabricating die parts been considered?

9.3 *Diemaking Practice*

Do strength requirements call for a steel die set?

Does the size or accuracy of the die necessitate the use of four guide posts?

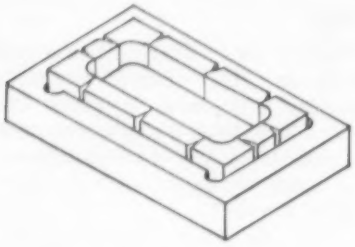
Have relief grooves or holes been provided to allow displaced air to escape from guide bushings?

Are the bushings long enough and are the guide posts properly engaged before the die starts to operate?

Has provision been made for lubrication of bushings and all other wearing parts?

Would the die block or punch be easier or more economical to make if built up of sections?

Have the abutting ends of the sections been relieved back of the cutting edges to facilitate fitting?



FITTING OF DIE SECTIONS MADE EASIER BY RELIEF ON ABUTTING ENDS

Is there ample material around die cavities to provide strength and minimize distortion in heat treatment?

Are all die sections, blocks and strips wide enough to give stability?

Have dowels been spaced as widely as practicable?

Have dowel holes been drilled right through to permit easy removal of the pins?

Where the load is unbalanced, have suitable heel blocks or drift lugs been used to relieve the guide posts of side thrust?

Is it possible to clamp together the die block, stripper plate and punch pad for boring the holes in line?

Has the strength of springs been accurately calculated?

Can springs be provided which have sufficient length to allow them to work properly without becoming overstressed or rapidly fatigued?

Have "safety pins" been inserted in springs to prevent broken coils from working loose and fouling other working parts?

Have spring pockets been chamfered to avoid pinching the coils?

Has the die design been balanced so that the "center of pressure" coincides approximately with the center of the press?

Where die parts have been recessed into the lower shoe, has recessing been avoided in the top tool, in order to minimize difficulties in alignment?

9.4 *Provision for Sharpening*

Does the height of punches and die include a reasonable sharpening allowance?

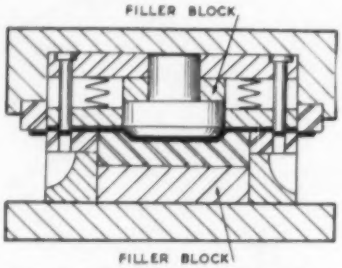
Are the stripper plates easily removable for sharpening the die?

Is it easy to take out pilots, shedder pins, locators, spring plungers, etc., when grinding the tool?

Have screw or bolt heads been sunk deeply enough into the die to be unaffected by sharpening?

Are tapped holes in the die face (for locators, guide strips, etc.) deeper than requirements, to allow for grinding?

How will loss of height, through sharpening, affect other parts and mechanisms of the die?



WHEN SHARPENING, GRIND THE SAME AMOUNT FROM FILLERS AND CUTTING FACES, TO MAINTAIN CORRECT RELATIONSHIP BETWEEN PARTS

Where forming or bending is combined with cutting operations, have the form punches been supported on filler blocks, which can be ground the same amount as the cutting members, thus preserving the correct relationship between all parts?

Is the shape of the punch or die such as to make grinding difficult?

Will the increased compression of the spring stripper, occasioned by sharpening, have an adverse effect on the springs?

Will the loss of height allow the guide post to protrude through the upper shoe when the die is closed?

9.5 *Provision for Repairs*

Are the guide-post bushings replaceable?

Have die bushings been used wherever possible for small pierced holes?

Have replaceable inserts been specified for all frail sections of the punch and die?

In progressive dies, have separate units been used for each stage?

Are all shear blades, wiping faces, punch heels, rubbing blocks, etc., made from easily removable, hardened steel of simple shapes?

Wherever desirable, has provision been made to take up wear by the insertion of suitable shims?

Has allowance been made for easy removal of "pressed in" parts?

Have jack-screw holes been included in parts which may be difficult to separate?

Are all small punches, or quills holding them, easily replaced?

Is it possible to remove and replace fragile parts without taking the die out of the press?

Have as many items as possible been made capable of removal without having to turn over the shoe or punch holder, especially on heavy tools?

Round Table

Payoff on the Sly

"Trying to get a man a special raise without letting the whole shop know about it is impossible, Ed. I got Harris a boost because of those special orders he worked on, and I asked him not to tell anyone. But now half a dozen of the men are badgering me for the same treatment."

"You should know better by now, Al. You can't keep a special raise a secret. Either the man starts bragging about it, or it slips out somehow. You'd better stick to the regular routine increases."

"Then I can't give a guy recognition if he does a good job. That's going to kill initiative. Why should anybody work hard if he knows the most he can get out of it is a pat on the back?"

"Well, I don't know—except I do know you can't keep a raise a secret, Al. Maybe we should have some kind of involved red tape to make it just about impossible for a man to get a special raise. Then, when you want somebody to get one, you clear away the red tape and make it possible."

"Then all the other men can still demand the same treatment. If the red tape can be cut for one, it can be done for more."

"All right; just forget the whole idea. Like I said; stick to the regular routine raises, and you won't have any trouble."

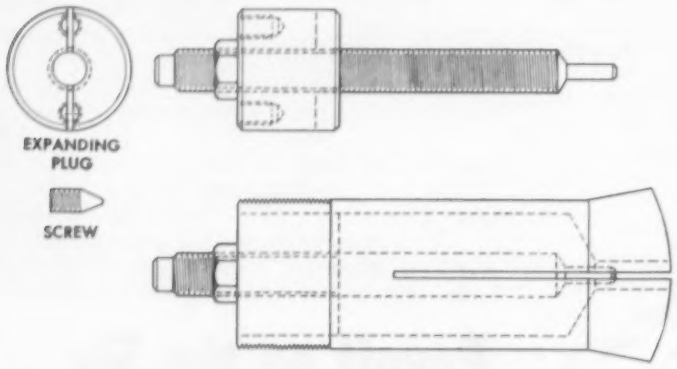
"There must be some way to get recognition for the guy who does better work, Ed. Maybe we could do it the opposite way—not keep it a secret. If we made a big announcement about how hard the guy worked and how much raise he's getting, they wouldn't have a leg to stand on. That would provide incentive."

"Then, maybe, some of the workers might be afraid to take the raise because the others would resent it. It might be a tough thing to pull off, Al."

"Listen, Ed; if a guy works hard, but is afraid to take credit for his work, then he's working hard for the wrong reason. Maybe because he's afraid of his job. Any good ambitious worker would be happy to get the credit—and the money."

***CAN** special merit increases be worked out to protect the formen from demands by others who don't deserve them, or is this just one of those problems that can't be solved? Your opinions may help others. Discussions of earlier topics start on page 226.*

Practical Ideas . . .



Collet Stop Is Helpful Accessory

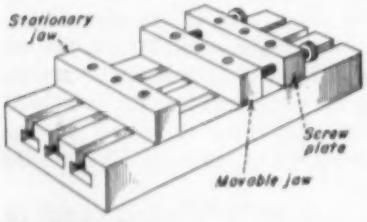
We have often faced a situation where we had to turn punches or similar work to a given length. This always presented the same problem; how to hold the work to get the same length parts in repeat operations?

The stop shown is simple in construction. It consists of an expanding plug, made to fit snugly inside the collet. It has a tapped hole through the center to suit the stop rod. Two holes are drilled and tapped on either side of the center hole to take the expansion screws. The plug is then slit about 4/5 of the entire height through the centers of the two expanding and center holes.

A point can be machined on the forward end of the threaded rod to allow it to enter into the chucking part of the collet when a short hold is necessary. A jam nut secures the stop rod in any desired location. The expansion screws, (we used 10-32 x ⅜-in. Allen setscrews) are ground to a 20° taper on the end.

Repeat operations can be performed with this stop, in conjunction with the carriage stop, to close limits.

H Norman Boles, Kenton, Ohio



Big-Capacity Milling-Machine Vise

When a job came along that was too large for our regular milling-machine vise, the illustrated setup was used. It can handle large parts and is particularly useful when the entire top face of the workpiece must be unobstructed. Its capacity is limited only by the size of the machine table.

Three bars of cold-rolled steel make up the jaws and screw-plate, and are cut to extend across the table. Three holes are drilled and counterbored in each bar to take the required size hollow-head capscrews. Holes should be carefully drilled with the same center-to-center distance as the T-slots in the table, to prevent binding.

The stationary jaw is located in its working position, indicated and tightened securely. The work is placed on the table against the jaw. Placing a small strip of paper under each corner of the work, and at the top edge of each jaw, is a good trick to use. It indicates when the work is down on the table, and when it's held securely.

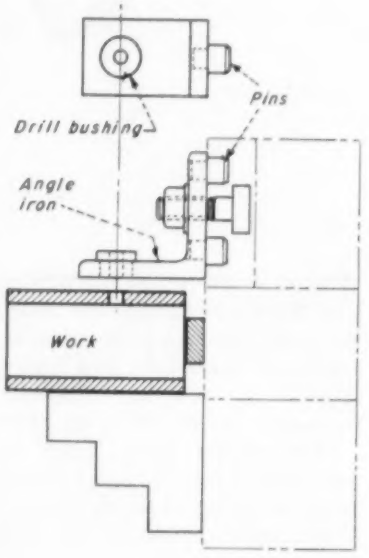
The movable jaw is then placed against the other side of the work and only snugly tightened. With vise screws backed off, the screw plate is fastened behind the movable jaw. The vise screws are tightened and the movable jaw screws are also tightened, holding the workpiece securely.

Paul Sterner, Los Altos, Calif

Angle-Iron Drill Jig Works Well

While many jobs are not in the extremely high production category, they may still be large enough to make it impractical for individual layout. Such was the case in our shop recently where we had to drill a small hole in each of a number of short lengths of pipe.

The job being a rush order, we needed a drill jig in a hurry. Illustrated is the setup we used, which was inexpensive to make and worked better than expected. A short length of structural angle iron replaced one of the jaws in an available three-jaw chuck.

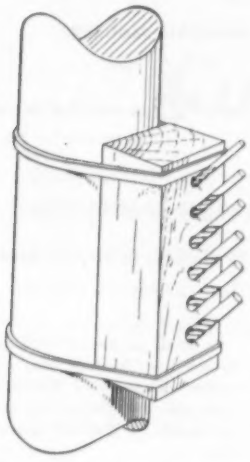


Into one leg was pressed two pins, the larger diameter a few thousandths smaller than the T-slot in the chuck. The other leg of the angle was reamed to a press fit for a drill bushing.

The angle was secured to the chuck face by a suitable T-bolt. A stop, made of flat stock and bolted to another T-slot, extends far enough to touch one edge of the pipe, maintaining the correct distance.

The chuck was secured to a good angle plate and placed on the drill-press table. Clamping the pieces was fast, and the makeshift jig turned out parts without trouble.

Roger Isetts, Kenosha, Wis



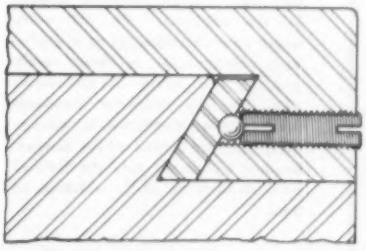
Drill Rack Saves Time

For the most-used drills, we have made a rack that is strapped to the column of the drillpress. This saves us the trouble of going over to the drill set on the bench, picking out the drill we need, and returning to the drillpress.

The drills we keep here are tapping sizes as well as body sizes for the most commonly used bolts. Reamer-size drills are also handy to keep near the drillpress.

The rack consists of a hardwood block with a series of holes drilled at a 45° angle. Two straps hold the block to the drillpress column, in a section where it won't interfere with the table.

Frederico Strasser, Santiago, Chile

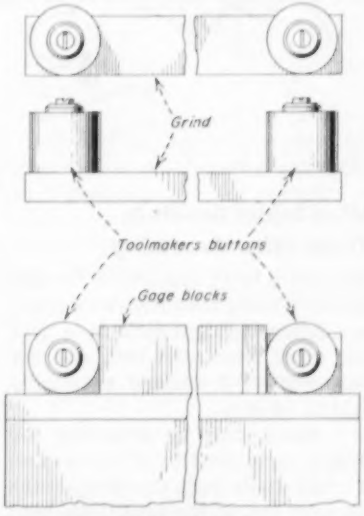


Modified Gib Screw Is Self Locking

We have a few small lathes in our shop, each equipped with a series of setscrews for the adjustment of the gibs. After the lathes have been in use a few years it is difficult to maintain proper adjustment on them because they have a tendency to loosen because of the vibration.

After having tried other methods to remedy this situation, I've had success with cut-point setscrews. The screws are annealed on the cup end and slotted to about 5/16-in. from the end with a hack saw. A small steel ball is inserted into the screw hole. The slotted screw is then threaded into place against the steel ball. The ball will now bear against the gib where it has been spot-drilled for the point of the setscrew. Pressure against the ball will spread the screw slightly, locking it in the hole with only enough force to prevent loosening. Screw is then adjusted as usual to the degree of looseness necessary for the operation of the slide.

H J Gerber, Stillwater, Oklahoma



Sine Bar Made With Toolmaker's Buttons

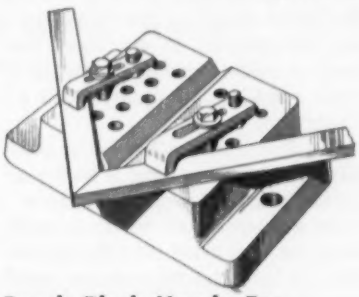
An accurate sine bar can be made on short notice and with a little careful machining. The only essential parts are two toolmaker's buttons and a length of flat steel.

The piece of steel is of rectangular shape, somewhat narrower than the buttons which are to be used. Only the two surfaces indicated actually need to be precision ground perpendicular to each other.

The screws holding the toolmaker's buttons should be fully tightened only after they are set on a tangent with the ground-edge surface, and at the correct center-to-center distance, usually 5-in. This distance is easiest attained by the use of gage blocks.

A good surface plate or a toolmaker's angle is necessary in assembling the parts.

George G Herzl, Phila, Penn



Bench Block Handy For Holding Parts In Assembly

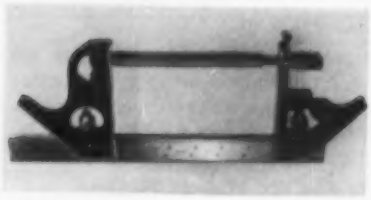
An old die shoe or any acceptable casting, plus a little time, will provide you with a bench block well worth the effort. It is particularly useful when parts must be welded, brazed, or soldered together.

After the faces have been checked for straightness, a V-groove is cut across the plate to provide clearance for welds. A series of holes is drilled and tapped in the top face for clamping purposes. They should be placed to allow the utmost in maneuverability of the straps.

We have used this block with much satisfaction on such operations, and we have also used it on special drilling jobs and other work.

It has proven to be a great time-saver.

Charles H Willey, Penacook, NH



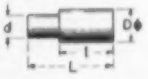
Micrometer Head On Combination Square For Long Measurements

We found ourselves short on large-size micrometers in our shop, but made a useful instrument out of a spare combination square head as illustrated.

The frame of the head was partially milled away, and a hole was carefully drilled and reamed to receive a micrometer head. A small setscrew was fitted into the scriber hole to lock the micrometer head into position.

With the help of a selection of micrometer standards, this instrument can be set to measure a variety of sizes accurately. It has been useful for a great many jobs requiring large-span measurements. As shown, it is set on a 12-in. hardened scale beam, but we have also used it on a 24-in. scale.

H J Gerber, Stillwater, Oklahoma



Multiple Go-No Go Gage Saves Time

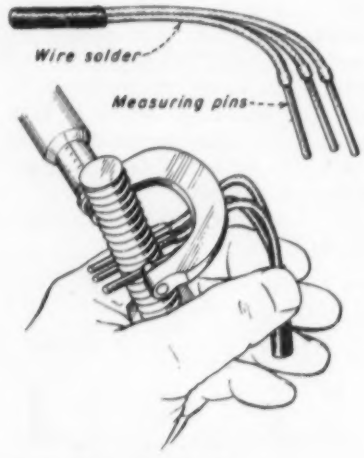
Checking workpieces where several dimensions must be controlled is generally a slow process. Too much time is lost in handling several gages, and there's the danger of errors and/or omissions.

By making use of a go-no go gage as that shown, these errors can be avoided. For a simple workpiece, also shown, where four dimensions must be checked, a gage of this kind is practical.

It should be made from good quality tool steel (ground flat oil-hardened tool steel is ideal). Hardening is advisable if the gage is to be used on a long-run job. The four gages are united in a progressive sequence (in our case: from the smallest diameter to the overall length).

Thus it is easy to avoid mistakes, and the testing is done quicker and with less fatigue to the operator.

Federico Strasser, Santiago, Chile



Wire Solder Assists In Three-Wire Measuring

We had a large amount of threads to check using the three-wire process. After finding it difficult to hold the three wires, the bolt, and the micrometer, I decided something had to be done.

I found that by attaching the pins to equal lengths of wire solder, I could easily keep the wires in the threads and at the same time hold the bolt. This leaves the right hand free to use the micrometer.

Using low heat, the pins are easily fused to the solder, so they are not harmfully affected. To make the wires more controllable, I tightly wrapped some tape around the loose ends of the solder.

This is the method we are now using on all our three-wire measuring jobs. They include a variety of parts employing threads demanding close tolerances, and just as awkward to manage.

Buckley Sullivan, Cleveland, Ohio

WINNER NO. 257

WILLIAM MAURER

won $25 in addition to regular payment for his idea:

ROUND CARBIDE TOOLS

in the issue of July 27, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

New Techniques Build '57 Cars . . . III

Final roundup in our series on how the auto industry has spent over $1 billion for new tools, processes, and equipment for the new models. It includes ideas on automatic assembly, integrated processing, and combined forming and welding, as well as automatic welding and handling for large sheet-metal parts, and even punched-tape control for production scheduling

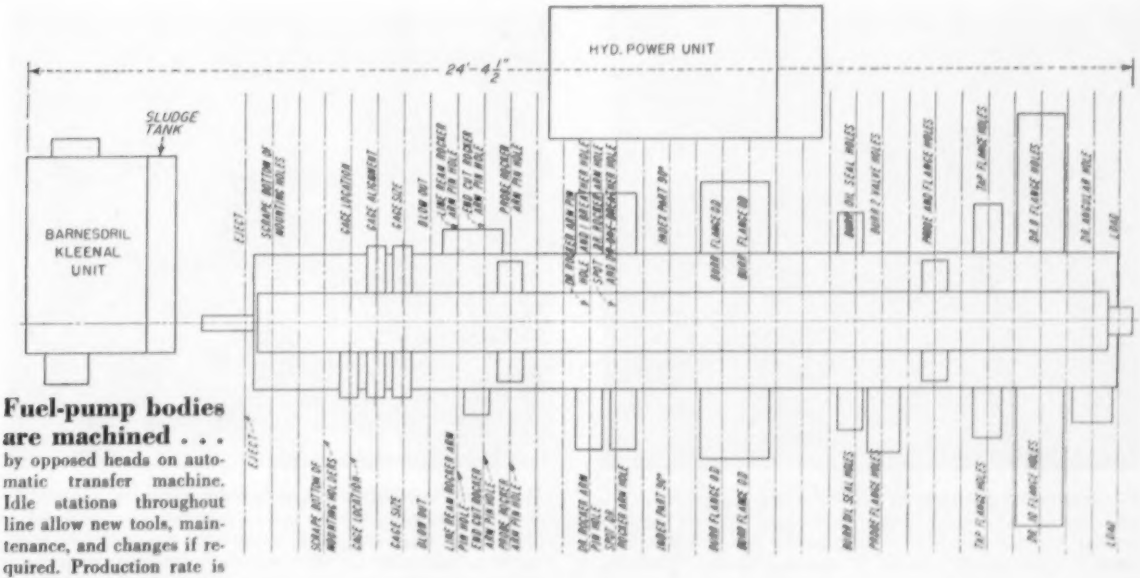
GEORGE H DE GROAT associate editor

. . . At AC Spark Plug . . .

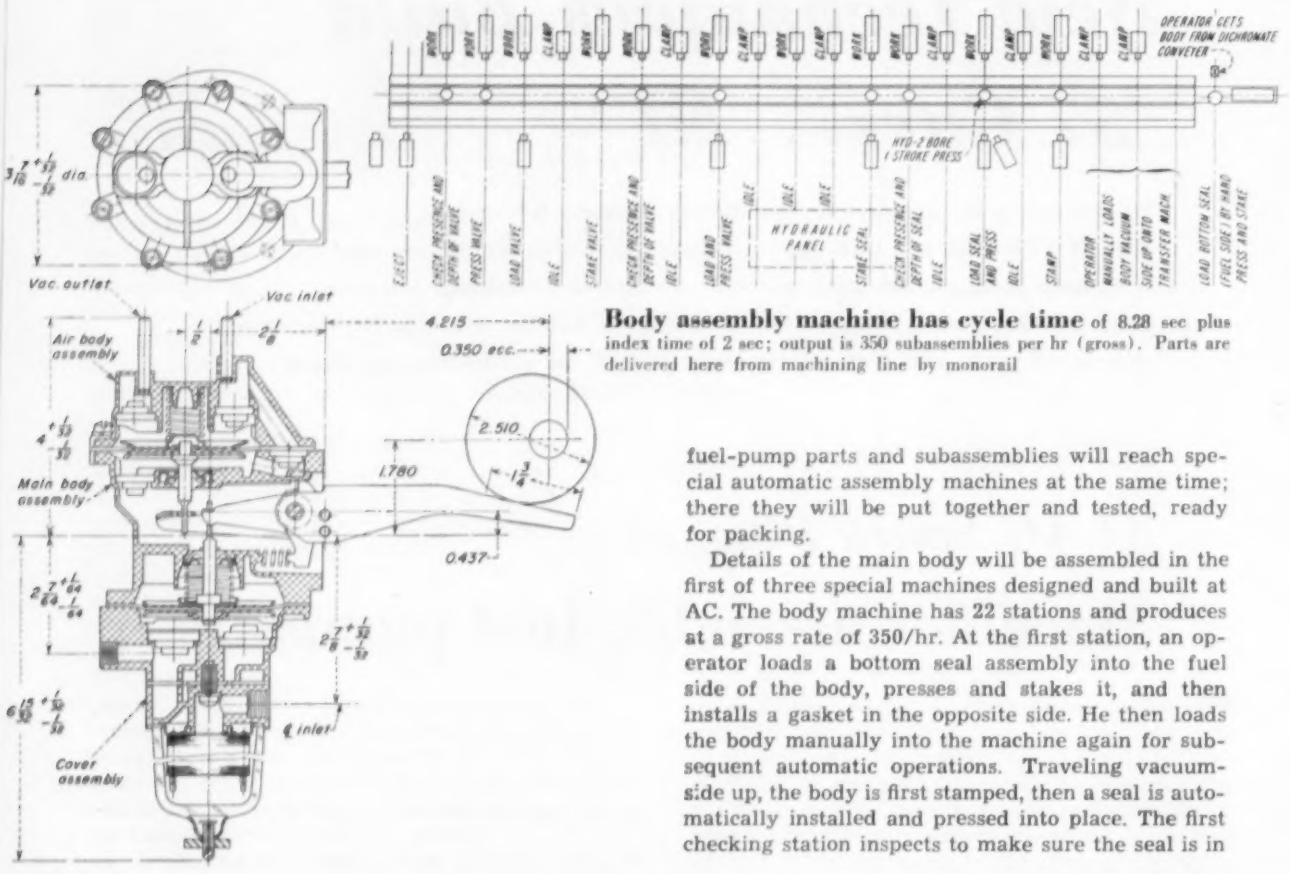
Machines assemble fuel pumps

Magnesium components will be hot-chamber die-cast at one end of a completely integrated line (*AM*—Oct 8 '56, p125) designed to keep work in progress moving along; the line also will include special machines developed by AC engineers. This is part of a multi-million-dollar improvement program that has enlarged the instrument-assembly area by 28,000 sq ft already, and is adding a 225,000-sq-ft manufacturing building to the east end of the main plant.

New fuel-pump facilities are now being set up, and will be served by overhead power-and-free conveyors (*AM*—Oct 8 '56, p 120). All die-cast parts will go first to the washers; after which the fuel-pump main bodies will be conveyed to a straight-line transfer machine that does automatic drilling, tapping, reaming, burring, and other operations. At the same time, other parts (including the fuel-pump cover and air body) will be processed on lines in balance and integrated with this one. As a result, all



Fuel-pump bodies are machined . . . by opposed heads on automatic transfer machine. Idle stations throughout line allow new tools, maintenance, and changes if required. Production rate is in balance with remaining assembly line



Body assembly machine has cycle time of 8.28 sec plus index time of 2 sec; output is 350 subassemblies per hr (gross). Parts are delivered here from machining line by monorail

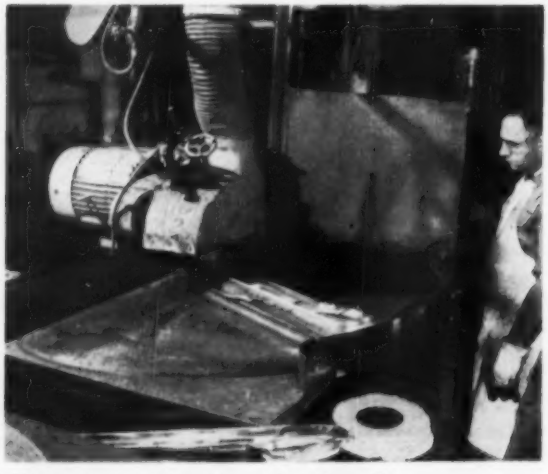
fuel-pump parts and subassemblies will reach special automatic assembly machines at the same time; there they will be put together and tested, ready for packing.

Details of the main body will be assembled in the first of three special machines designed and built at AC. The body machine has 22 stations and produces at a gross rate of 350/hr. At the first station, an operator loads a bottom seal assembly into the fuel side of the body, presses and stakes it, and then installs a gasket in the opposite side. He then loads the body manually into the machine again for subsequent automatic operations. Traveling vacuum-side up, the body is first stamped, then a seal is automatically installed and pressed into place. The first checking station inspects to make sure the seal is in

Also at AC . . .

Integrated lines finish die

Instrument panels from casting machine . . . are dropped into water trough with belt conveyor running through it. This carries parts to trimming press (left) where scrap is automatically removed to remelting furnace. There are 13 such setups that include both Cleveland and Cast-Master machines



Work is oscillated under brushes . . . at Acme buffing machine by special mechanism to suit contours of the piece. Rack and pinion under table drives fixture according to a cam made for the particular part. Panel reciprocates twice in one direction, twice in the opposite, then is stopped and unloaded automatically

and at proper depth. Then the seal is staked. Next a valve is inserted, checked for presence and depth, and staked. Another valve is inserted, checked, and staked; then the body is automatically ejected to a belt conveyor on which subassemblies such as a rocker arm, links, spacer, and bushing are put together; then assembled to the body with a temporary pin. Another subassembly added here is the fuel diaphram.

A unique feature of the body assembly machine is a memory circuit at each of the three checking stations. This prevents staking at the next station if the seals and valves have been left out or not installed correctly. If two successive assemblies are defective, the machine stops. In addition, the memory circuits are tied in with the ejection station that removes defective parts. At stations where parts might hang up, there are safety switches to stop the machine and thereby prevent damage. The machine is also equipped with controls for stopping it in emergencies; not only at the front, but along its length as well.

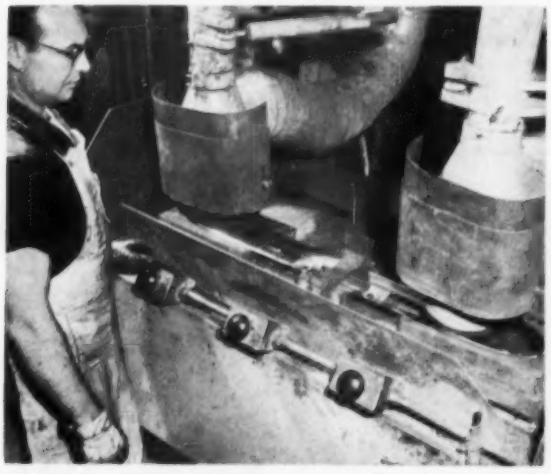
The second machine has 37 stations in four sections, and will add fuel covers to the bodies. A manually operated press first replaces the temporary pin with a permanent one. The operator removes the body from the press, adds a spring, retainer, and diaphram to the body, and starts the unit—fuel side up—into the transfer machine. The fuel cover is added from a conveyor by an operator in the first section of the machine. Cover and body are aligned, then the diaphram is flexed and the screws driven into place. Flexing the diaphram insures sufficient movement in operation without tearing or other damage. With the cover in place on the body, all subsequent operations are automatic.

In the second and third sections of the machine, screws will be hopper-fed to the assembly, and positioned and driven by pneumatic tools. Probes check for improperly set or missing screws, and an automatic ejection station removes defective assemblies. The fourth section air-tests the fuel-cover assembly just before an ejection station, where parts that do not meet specifications are removed. A prime test is next, followed by another ejection station, and a pressure check is the final operation. Defective assemblies are ejected, and parts that meet requirements are automatically unloaded. The memory circuit in this machine is also tied in with the ejection stations that follow tests.

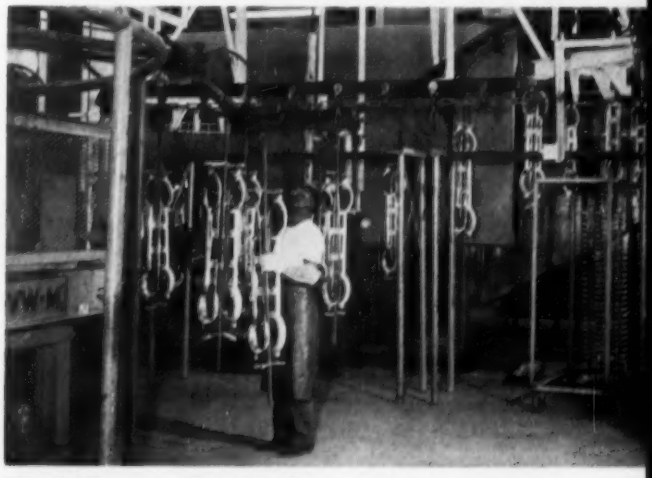
The last machine has 25 stations in three sections, and will assemble the air body to the fuel pump. Again, two operators are required; one to remove subassemblies from a conveyor belt connecting to the preceding machine and to load the parts—vacuum side up—into the third machine. Diaphrams are centralized automatically by the machine, and air bodies are loaded by the second operator from an adjacent conveyor. In the second section, the machine loads and drives screws and probes for misfits; and vacuum testing is done in the third section.

This machine also has automatic unloading, memory-circuit control of ejection of defective parts, and automatic shutdown if two consecutive parts are defective.

castings



Shaped wheels buff internal contours . . .
while fixture oscillates according to cam contour. One operator runs two Acme machines, unloads parts to three-track chute leading to hand touch-up operation. Transfer from there to washing and plating is conveyorized; no storage is required except where panels are loaded on the conveyor



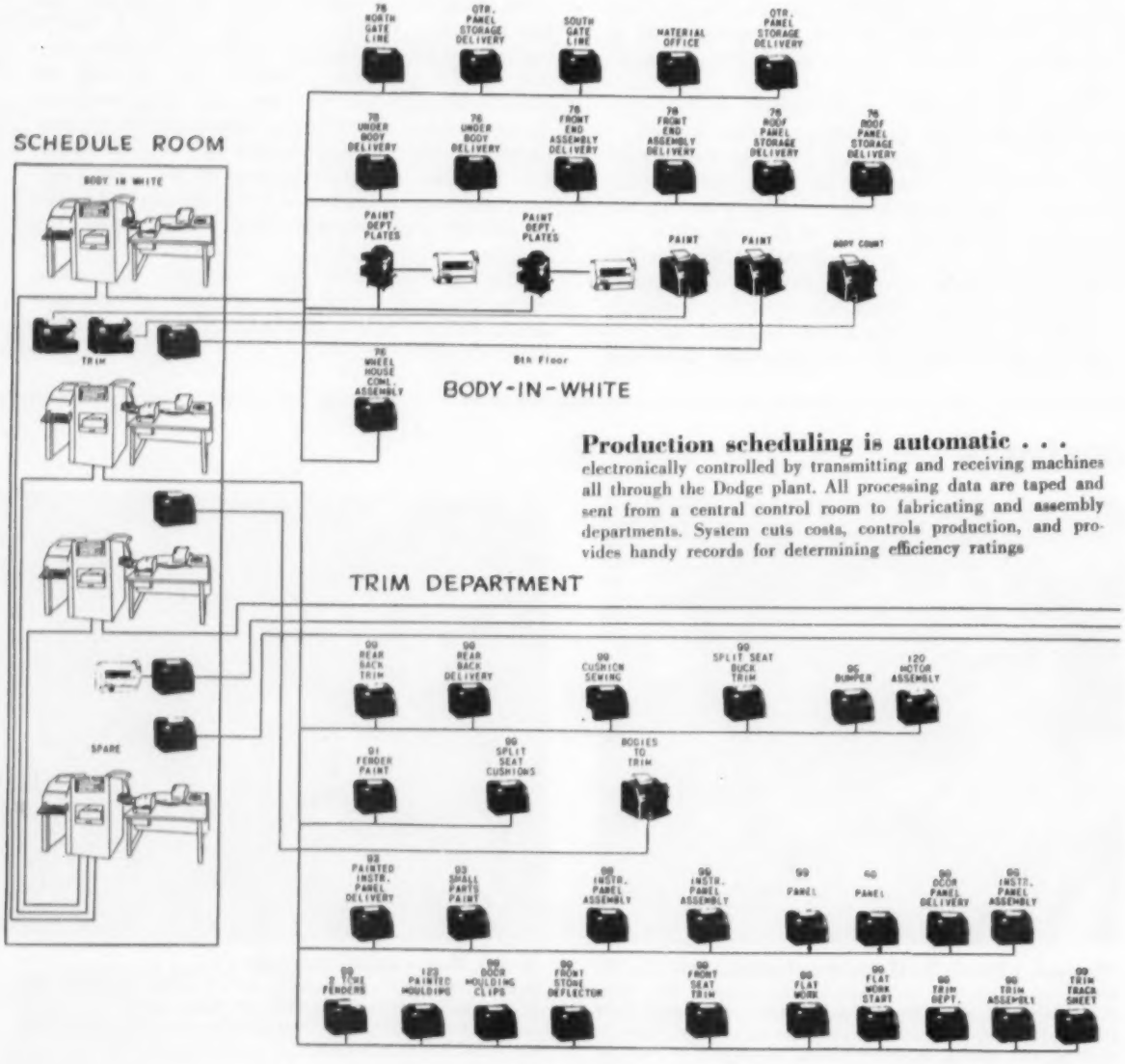
Work flows continuously . . .
through Metalwash power washer, then is loaded to carrier arms of Hanson-Van Winkle-Munning automatic plater for copper-nickel-chrome coating. At final packing area, mounting studs are added before wrapping

...at Dodge... Electronics spark production-

Communication between the ordering section and all the production departments at Dodge is handled by a system of 65 machines designed by Michigan Bell Telephone Co. This equipment transmits and records scheduling orders with minimum human error (previously encountered through typographical errors with manual equipment on the lines), and provides a smooth, uninterrupted flow of parts from the time a sales order is received until the car comes off the line; completed. The system has substantially cut costs and increased efficiency.

When an order from a dealer is received, it is first checked in the sales department, then sent to an IBM key-punch machine that codes a card with all information necessary for production of the desired car. The card is filed in a five-day schedule float according to date of order and type of body. Each morning a day's framing schedule is made up from these cards and sent to the body department.

Before this information is "broadcast," however, the cards are inserted in a card-to-tape converter, and it is the tape that is fed into the automatic transmitter. This equipment assigns a sequence number to a body track sheet and sends body information to all receiving machines in the body-in-white area. Simultaneously, a by-product tape is fed directly from one of these receivers into an automatic Addressograph machine in a schedule office in the



Production scheduling is automatic . . . electronically controlled by transmitting and receiving machines all through the Dodge plant. All processing data are taped and sent from a central control room to fabricating and assembly departments. System cuts costs, controls production, and provides handy records for determining efficiency ratings

line scheduling

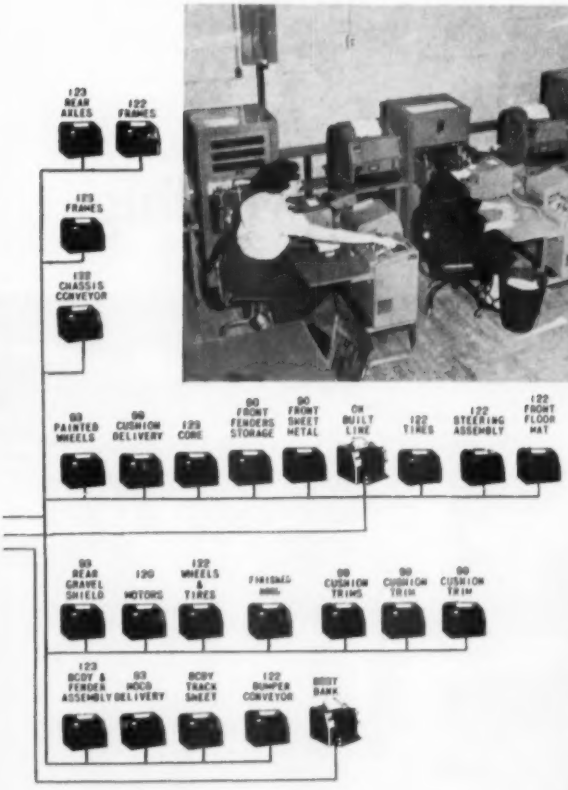
body-in-white department. This prints metal tags with specific data corresponding to car requirements, and the tags are fastened to the bodies as they are removed from the framing fixtures. At this point each body has a sales order number and is destined to become a specific car for a dealer.

IBM cards are removed from the converter and filed in "Framed-Hold", to be picked up later for statistical data. When the body is completely built and ready for paint, its sales order number is teletyped to the control room so progress can be recorded. In addition, a master IBM card is filed to provide an efficiency record for the body-in-white department. It is duplicated before filing, and two spaced IBM cards are placed in an "In-Paint" file.

When the body is completely painted and inspected, the sales-order number is again teletyped to the control room and the "In-Paint" cards are removed from the file, converted to tape so data can be transmitted to the trim department, then placed in an "In-Trim" file. The trim department receives a sequence number and all specifications for that body, and complete control is maintained.

The same routine follows through trimming, assembly, and final inspection; a card is used to convert specific orders for a specific car into tape, the tape sends instructions automatically to the department receiving the car body, and the card is filed. The body-in-white department adds window lifts, air conditioners, defrosters, fenders, and other parts according to these orders, and the trim department assembles instrument panels, heaters, and so on.

Finally, when the car is through assembly and is completed, the master card is placed in a "Built" file, a duplicate is made for efficiency record, and the two spaced cards are held temporarily—later destroyed. Tape is converted back to card form and used for compiling statistics.



FINAL ASSEMBLY

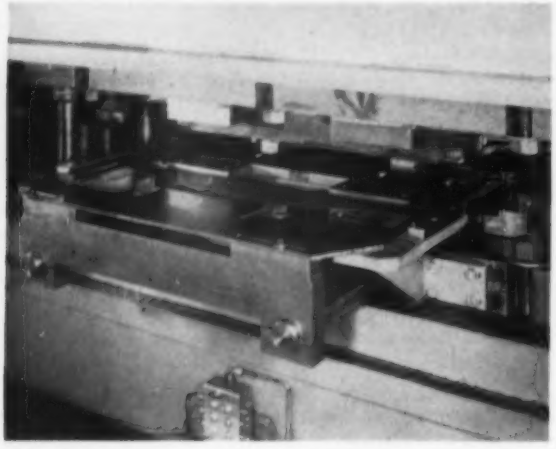
Metal tags are Addressographed automatically . . .

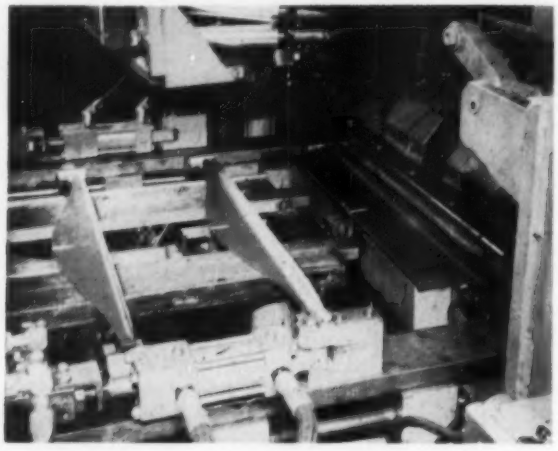
from punched tape, then attached to auto bodies in an early stage of assembly. They indicate desired power accessories, sales-order number, and other data. Four feedback systems and nine machines in the system keep the control room informed of progress

"OK-Built" is the final feedback message . . .

relayed to the control room after inspection. Information is manually typed out and transmitted electronically

. . . at Chrysler . . .

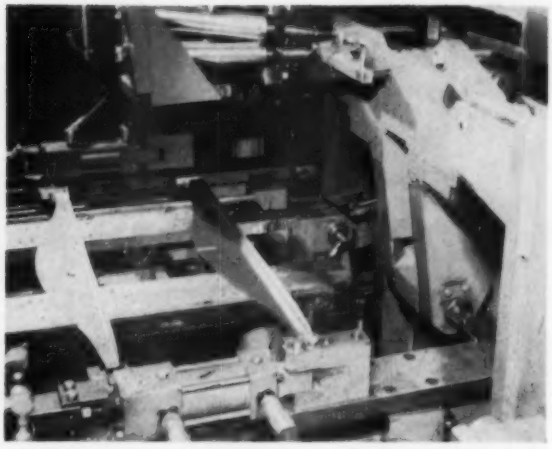


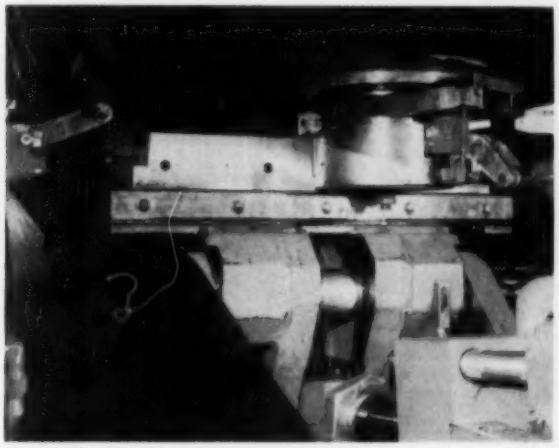


Blanks are manually fed . . .
to a stacker at the first station. Then 85-ton hydraulic press flanges one end; at same time center section of blank is embossed, and one end is staked in the opposite direction. Automatic transfer to the curling station follows; there the flanged blank is located against a forming shoe (horizontal at right)

Mechanized forming and welding

Combined forming and welding . . .
is done in Delta Welder Corp machine that flanges, embosses, curls, and spotwelds the 0.039-in. cold-rolled stock automatically. Production is about 600/hr at 80% efficiency; a considerable increase over anticipated rate with conventional equipment. Tool costs are lower, and savings amount to thousands per year





Blanks are indexed 90° . . .
by hydraulic linkage to bring them against vertical forming roll. Blank is held by retaining pin as roll rotates and moves across machine bed. Travel equals peripheral length of part, so 360° curl is produced. At end of stroke, overlapping ends are spotwelded

streamline output

Two recently improved operations at Chrysler's Nine Mile Plant contribute parts for Plymouth, Dodge, De Soto, and Chrysler cars. One is a combined forming and welding unit that produces a stamping classified as "difficult." The Delta welder fabricates headlamp rings for Plymouths, savings thousands per year in material, labor, and tooling costs. In addition, the self-contained equipment is safer because it eliminates many hazards common to manual operations.

Blanks are manually loaded into the machine, and are then automatically flanged, embossed, curled, and spotwelded. After the operation, the parts are unloaded automatically onto a conveyor that carries them to two 100-ton presses that trim and pierce the rings.

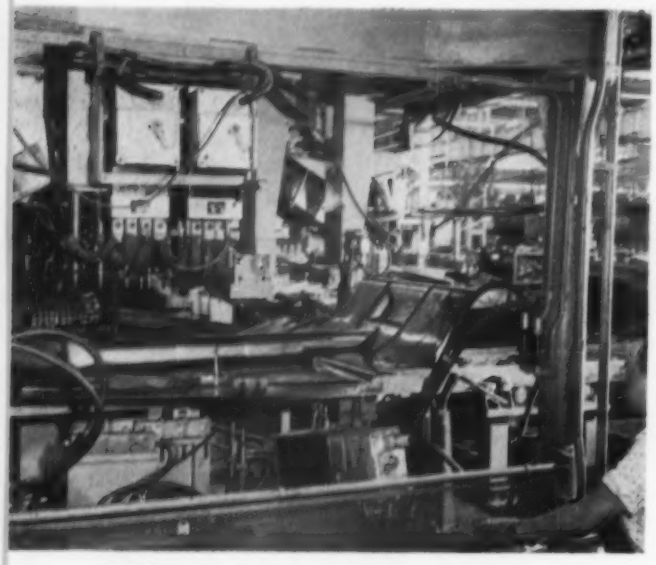
The second operation of note is floorpan production, where 69x109-in. sheets of drawing-quality stock 0.036 in. thick are trucked to four presses that are interconnected by unloading and transfer mechanisms. A sheet feeder delivers stock to the first press for drawing and embossing, and unloading and transfer equipment moves it on to the next press for trimming and piercing. About 40 holes are cut to clear steering column, dimmer switch, brake pedal, and others. Piercing tools are removable to suit the needs of various models. The third press flanges and restrikes the pan, pierces two holes, and extrudes three others. The final press pierces the floorpan tunnel by means of cam-actuated tools.

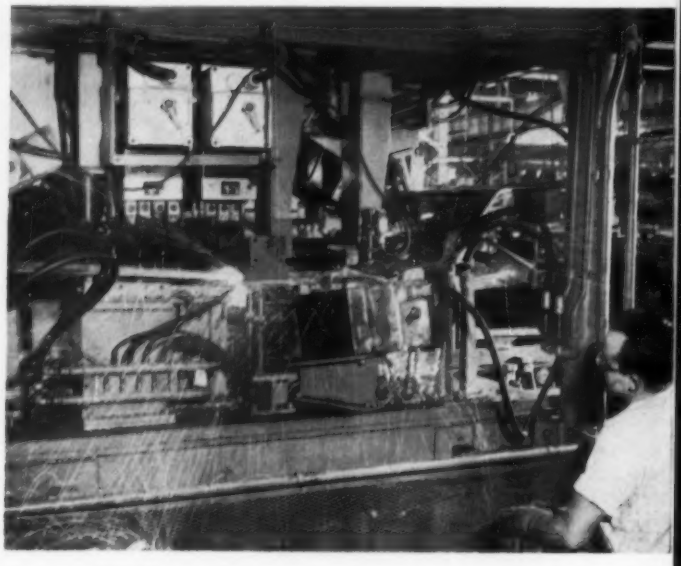
Welding the floor-pan components together is also handled on mechanized lines. On the first line, the pans travel through a two-station Link welder where relatively small details are added. A second line parallel to this one joins cross braces and inner side sills to form the ladder assemblies. Both lines end at a transversely directed third line where the two sections are joined.

The third line includes four Danly presses with "sandwich" dies or welding tools that can be removed merely by disconnecting power and water lines. Each die has about 80 welding points that increase the rigidity of the assembly.

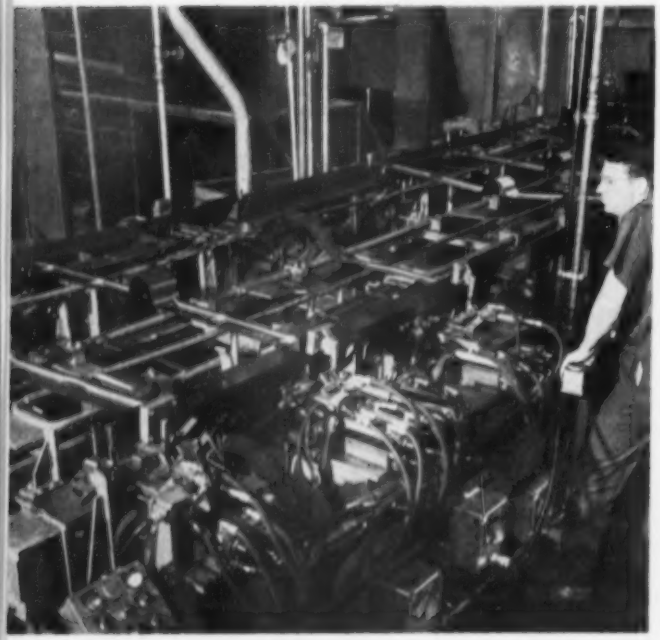
At the end of this line, the pans are unloaded into chutes that carry them to a gravity-fed conveyor system, where a station clamps them one at a time and then turns them over for automatic loading into a shop truck. As each pan is loaded, the truck moves back about 5 in. so the finished load is properly stacked. When one truck is filled, the next pan is automatically shifted to a second gravity conveyor and the operation is continued at a second truck. In the meantime, the loaded truck is taken away and replaced with an empty.

New techniques build '57 cars...III...

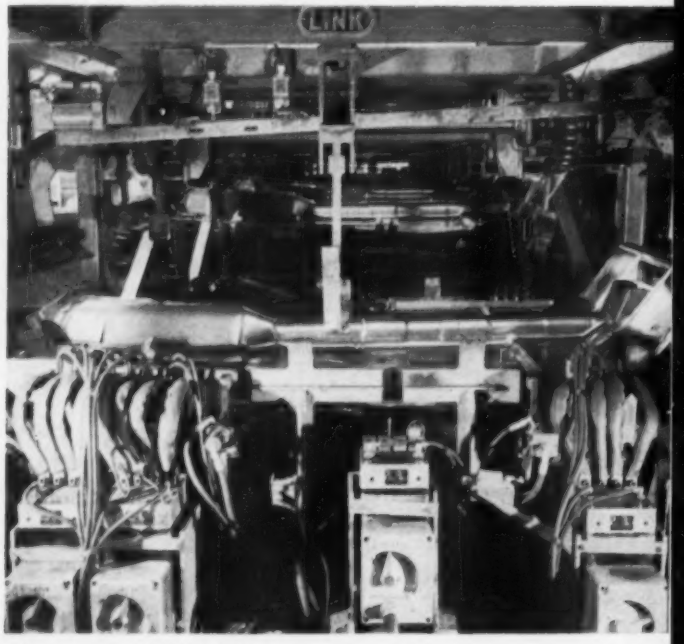




Eight parts are welded to floor pan . . .
all delivered automatically by chutes and positioned and clamped. Platen is raised by operator to bring work up to spotwelding heads. At 80%, production runs around 300/hr. Elements added include differential carrier and bumper bracket



Ladder assembly . . .
is welded in line running parallel to floor-pan assembly line. Three cross braces and inner door sills are welded together here, after being positioned by transfer mechanism. Welding cycle is automatic



Floor pan and ladder come together . . .
at start of automatic line running at 90° to other two lines. Floor pans unload automatically from detail line to this; ladder is added, then assembly moves on through four Danly welding presses where about 320 weld spots are made to stiffen and reinforce the unit

. . . at Chrysler transmission plant . . .

Middle-ground automation for the Torque-Flite

as told to BEN C BROSHEER, associate editor
by JAMES R CYPHER, plant manager, BRUCE G FIELDS, master mechanic, and WILLIAM L MIRON, plant engineer, KOKOMO, IND. PLANT, CHRYSLER CORP

Torque-Flite automatic transmissions, installed in some 1700 Imperial cars since early this year will be available for Imperial, Chrysler, DeSoto, Dodge and Plymouth passenger cars during the '57 model year, are being made in an entirely new 810,000 sq ft plant erected on a 158-acre site near Kokomo, Ind.

More than 1100 machine tools and other production units are installed in the 685,000 sq ft manufacturing building, where more than 2½ miles of overhead monorail conveyors are used to move finished parts from machining and heat-treating areas to storage and assembly areas. Combined length of the eight under-floor flume chip removal and cutting fluid clarification systems is approx 1½ miles. Some 5000 gages, including some novel automatic gaging and parts sorting units, are available to insure continuous control of product quality.

Handling mechanized to suit jobs

Wherever studies justified their use, automatic machine tools have been installed for operations on transmission parts. In many cases this has included the installation of automatic loaders and unloaders on the machines.

But movement of work between the several machines in each production line varies widely, with amount and type of mechanization depending on the results of over-all cost-per-piece studies. It ranges from simple home-made chutes to fully automated production lines. Except for the long case machining lines, only two transfer-type machine lines are used.

For most of the lines, handling is what should be termed *middle-ground* automation, with chutes and elevators moving work between the machines, delivering it for either manual or automatic loading into the next machine.

Even heat-treating operations have been made as automatic as possible. Press quenching of gears have been supplanted by Marquenching with considerable saving in cost and maintenance.

Finished parts, ready for assembly, are loaded into wire baskets, then moved manually onto carriers of one of several overhead chain conveyors for movement to the assembly area. Basket loads of parts are removed at the subassembly and final assembly lines if needed, or pass through the assembly area into a finished-parts storage area.

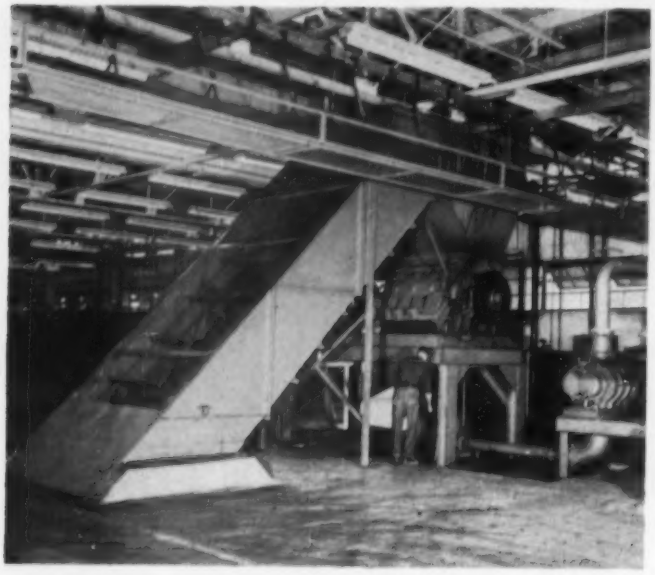
Eighty 50-ft long sections of skate-wheel gravity roller conveyor spaced to handle the standard parts baskets are arranged in the parts holding area for segregated storage, in their baskets, of parts not immediately needed.

When it leaves the assembly area, each overhead chain conveyor passes the loading ends of the storage conveyors. Baskets of parts remaining on the chain conveyor hangers are removed here, and placed on the proper skate-wheel conveyor. There is space for holding approx 10,000 of each part.

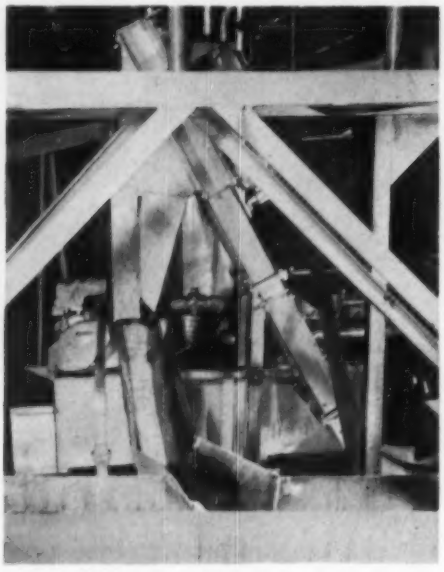
This storage system insures automatic stock rotation, since the baskets containing the oldest stock roll to the discharge ends of the skate-wheel conveyors first, and therefore are the first to be removed for return to the assembly area.

Each overhead chain conveyor bringing finished parts to the assembly area passes the unloading ends of the lines of skate-wheel conveyors, and baskets of parts are easily secured from stock for assembly as needed.

Velocity trenches remove chips and coolant



Steel-chip disposal center . . .
consists of a drag-chain conveyor to lift chips from 4000-gpm underfloor coolant clarifier, a Type ST-T American chip pulverizer, and a crushed-chip blower system for delivery of chips to outdoor gondola. Duplicate centers serve flume systems collecting chips from the two steel machining areas



Chip elevators in sumps . . .
of broaches and other machines using heavy oil cutting fluids raise chips for discharge into water-soluble coolant-flushed chutes leading to underfloor flumes. Flow of fluid prevents buildup of chips

Eight separate coolant clarification and automatic chip-handling systems are an integral part of the original plant design. All of these systems use underfloor flumes (velocity trenches) to deliver used water-soluble coolant to Hoffman flotation-type clarifiers for cleaning prior to reuse. The same flumes in each case carry the chips to elevators, and crushers if needed, and then to overhead pipe systems through which they are blown into railroad gondolas on outdoor tracks.

Except where the metalcutting operations require high-pressure cutting oils, as in some of the automatic broaching operations and in the transfer machine that gun-drills intermediate shafts, all of the machine tools in the plant have been set up for cutting with water-soluble coolant. In addition, they have been arranged to discharge used coolant directly to adjacent underfloor flumes without reuse prior to clarification. This used coolant also carries chips from the machines into the flumes.

Even the multi-spindle automatic bar and chucking machines, and most of the automatic screw machines have been arranged to use water-soluble coolant. This has been made possible by rearranging headstocks to use mist or fog lubrication systems at pressures slightly above atmospheric, so the cutting fluid is kept out of spindle bearings. While, in some cases, this practice is directly contrary to makers' recommendations, in more than a year's time it has not been necessary to replace a spindle bearing in a machine so lubricated. During the same period, several spindle bearings in conventionally-lubricated machines have required replacement.

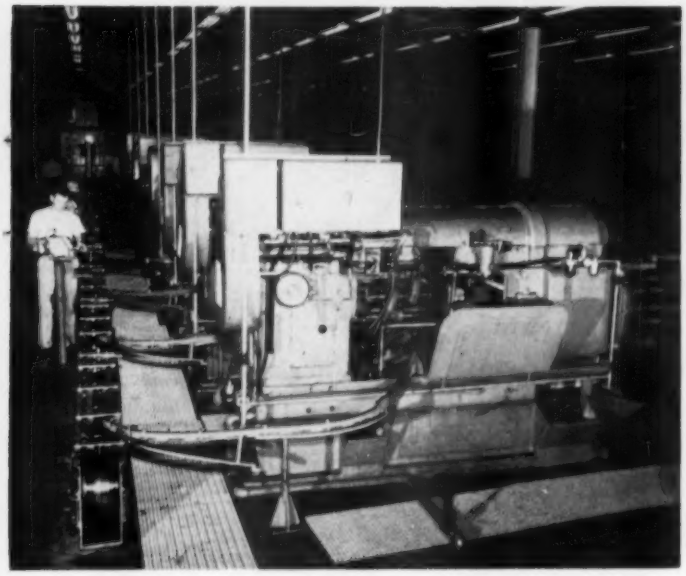
To permit using properly compounded water-soluble coolants when machining steel, malleable iron, cast iron, and aluminum, the eight underfloor flume systems are entirely separate, except in the adjacent CI and malleable-iron systems. There a connecting flume is provided for future flexibility.

Because machine requirements differ in the several machining areas, coolant capacity of the eight flume systems vary considerably. Rate of flow:

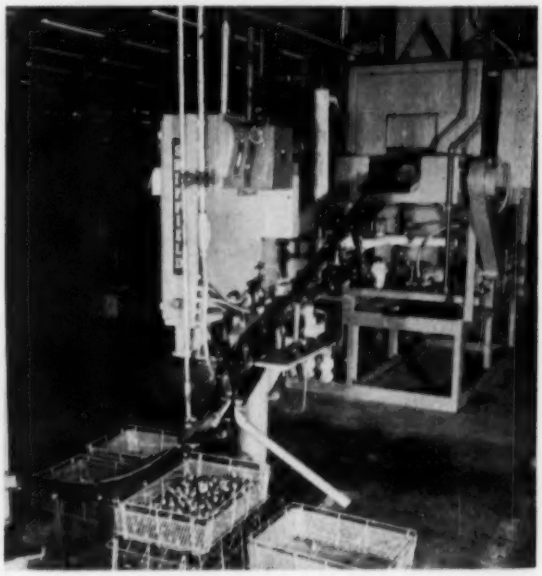
Cast-iron machining	1700 gpm
Malleable-iron machining	2000 gpm
Major steel machining	4000 gpm
Finish grinding area	1500 gpm
Screw machining area	4000 gpm
Valve grinding area	2000 gpm
Aluminum machining	2200 gpm
Case-machining lines	2800 gpm

A major dividend from use of these central coolant systems, and the cleaning of all water-soluble coolants prior to reuse, is the increased life of cutting tools obtained because coolant pumped to machining areas does not carry fine, abrasive chip particles. The systems also cost less to operate than do most cutting fluid and chip-handling installations.

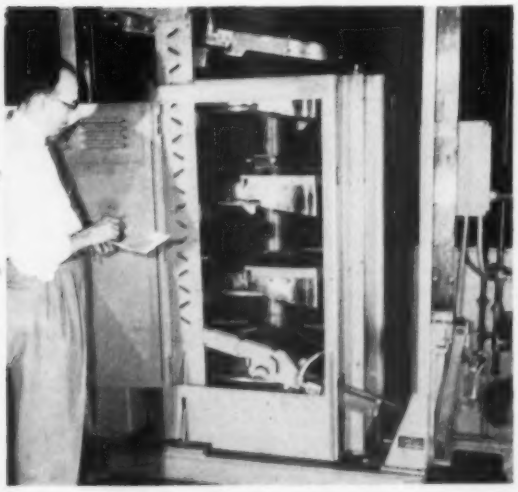
Planet pinion production is highly automated



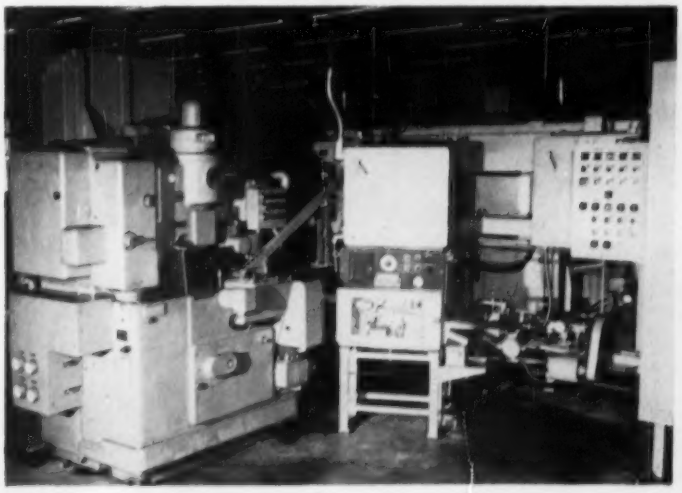
Pinion blanks are cut . . .
from SAE 4028 bars in group of seven 1⅝-in. capacity, 6-spindle Conomatics, then are chuted to storage lines on steel belt conveyor. Quality-control inspector spot checks blanks in each accumulated group before releasing it for mechanized delivery to washing machine and automatic air gage. Six pinions are required for each transmission, so production exceeds 1200 per hr



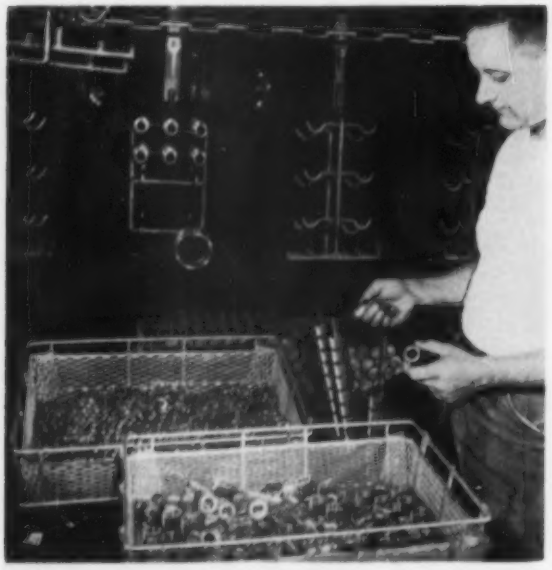
Automatic air gage . . .
in pinion blank line provides 100% inspection of bore size and taper before blanks are conveyed to straddle-facing lathes and gear shapers. Bore must be held within 0.001-in. tolerance for size, and within 0.0002-in. for taper and out-of-roundness. Rejected blanks are sorted into baskets, accepted blanks are chuted to Lo-Swing straddle-facing lathes where blank ends are faced



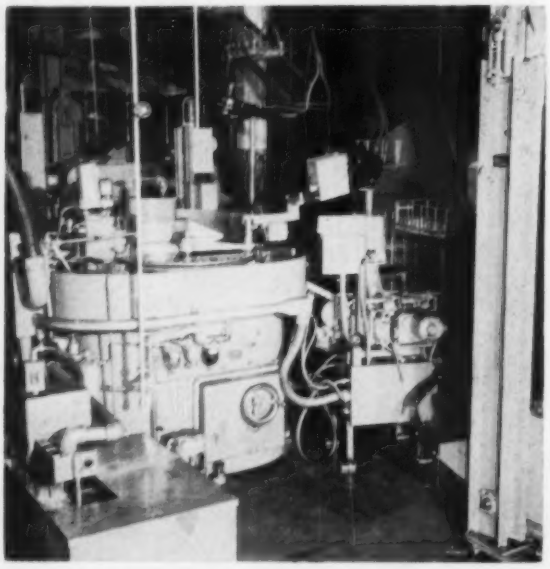
Lamb storage units . . .
(opened for inspection) are used at several points in pinion line to serve as parts banks ahead of automatic production lines. Each has by-pass chute for direct delivery of incoming parts to following conveyor system, and helical storage chute, with capacity for 3000 pinions, which fills gradually when following system is filled and will not accept incoming pinion blanks



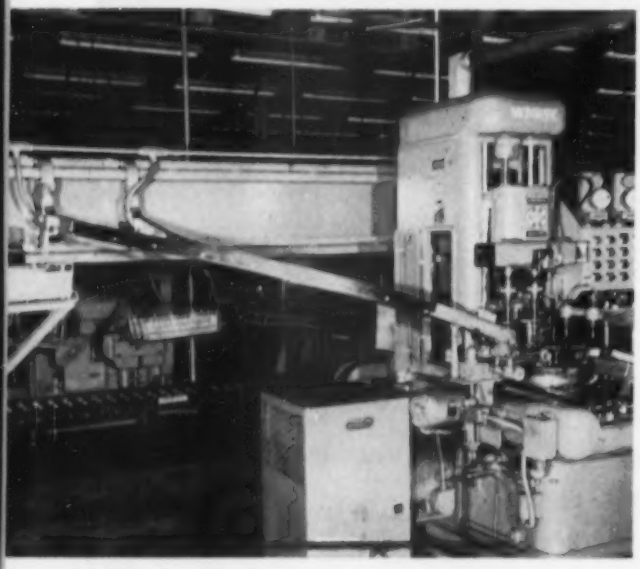
Pinions semi-finish cut . . .
in No. 4 Fellows gear shaper (left) are chuted through an air feeder, where chips are blown away, into a Fellows *Pinion Sizer* (center) where PD and runout of teeth are checked. Shaper is shut down automatically if third out-of-size pinion successively is checked by gage. Bellows-Locke unit (right) deburrs pinion teeth. Bank of 8 shapers cut the teeth, then 14 like this setup semi-finish, finally 8 Fellows shavers finish and chamfer teeth



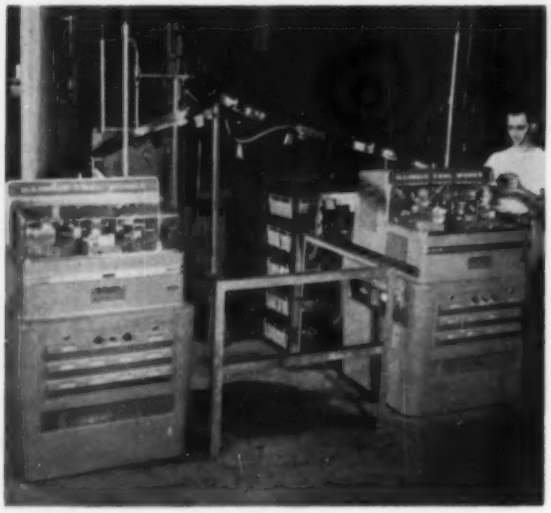
Pinions are loaded manually . . .
for carburizing, Marquenching, and drawing to 58 to 61.5 R_c, then shotblasting. Only six such manual operations are required in entire production line. Pinions are removed from rods manually at rack which separates pinions from washers, then feeds them through Syntron vibrator, Lamb storage cabinet, and elevator-chute conveyor system to automatic Sheffield gear grinder where acute corners of pinion teeth are chamfered



Opposite faces of hardened pinions . . .
automatically are finished flat within 0.0003 in., parallel and square with the bore within 0.0005 in., in this Micromatic lapper. Unit is controlled by automatic electronic gage which checks each part as it leaves the machine, controls machine to compensate for wear, and ejects bad pieces

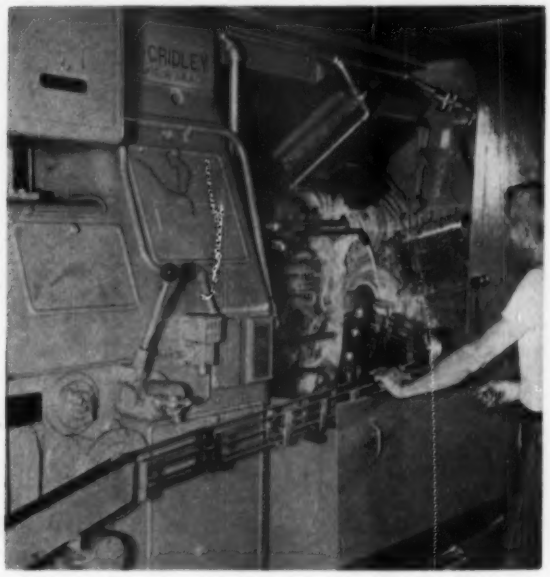


Final finishing of pinion bores . . .
is in special 2-spindle Micromatic honing units automatically fed from novel steel-belt conveyor system which has two feed chutes leading to each of four machines in group. Bores of pinions automatically are held within 0.0005-in. for size, and within 0.0001 in. for taper and out-of-roundness

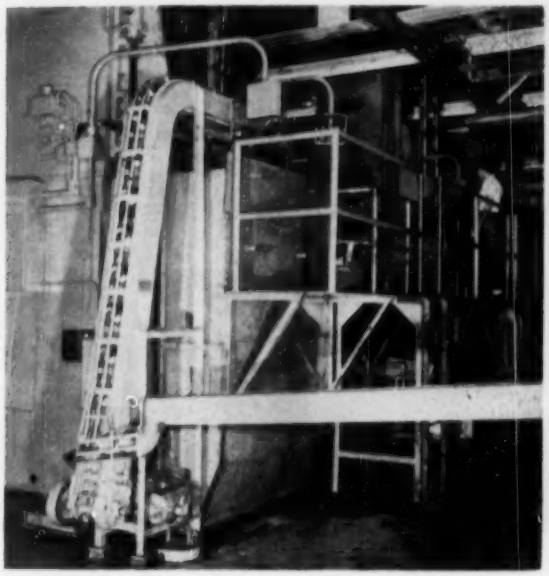


Gear checkers in pinion line . . .
inspect finished pinions for PD size, runout, lead aberrations (wobble), tooth-to-tooth spacing errors, and nicks. Each of two Illinois Tool Works machines has gross rate of 720 per hr, sorts rejects into separate bins for quality control purposes, and passes accepted gears through chutes to conveyor baskets

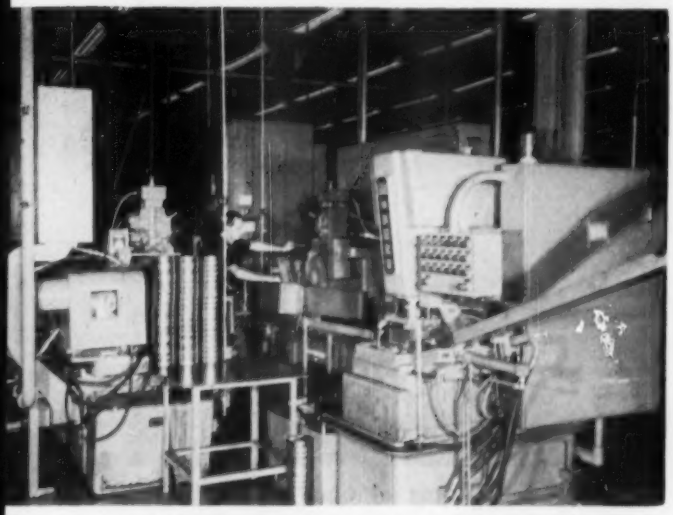
Automated machines make annulus gears



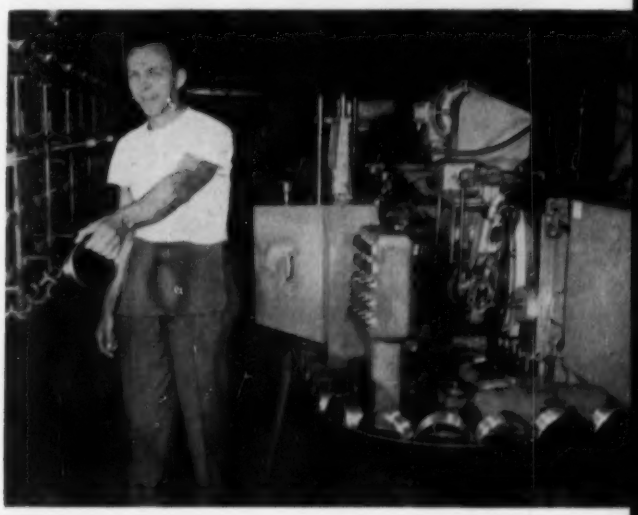
Annulus gear ring is cut . . .
from 6-in. OD, 4-in. OD seamless steel tube in 6-in. capacity, 6-spindle Acme-Gridleys. Each is equipped with an air-actuated pickoff pin to transfer cutoff piece from the spindle position to a rod chute (foreground) that carries ring to elevator for chute-transfer to 2-spindle, 5-station Hoern & Dilts Continu-Matic automatic precision boring machine which finishes the ID profile prior to tooth broaching



Helical internal teeth are broached . . .
in annulus rings with automatic American vertical machines, to which rings are fed by automatic elevators. Two gears are cut per machine cycle, with a gross production rate of 200 gears per machine-hour. Sulfurized cutting oil used is drained from chips as they are elevated for discharge to underfloor chip flume. Two broaching machines are permanently tooled for each of two different gears, the third can be set up for either. These three were purchased and tooled at less cost than tooling alone for the 53 gear shapers otherwise required.

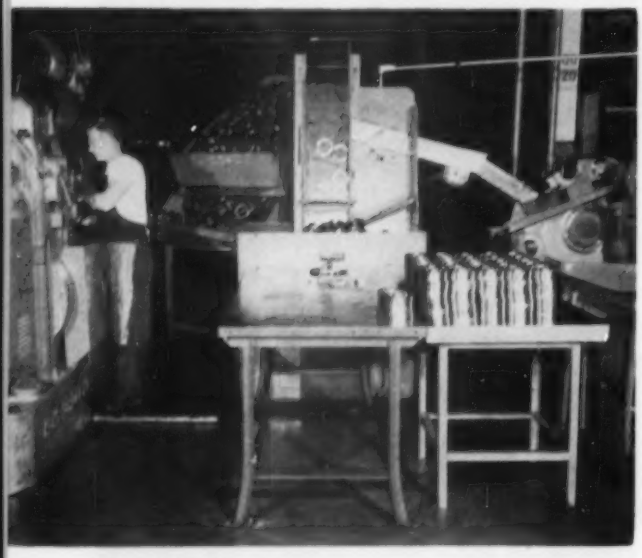


Washed and dried kickdown gears . . .
are chuted to Modern automatic internal-chamfering machine (foreground) where acute sides of gear teeth are chamfered. Gears then are chuted to nearby angle-head automatic Cincinnati twin-spindle chucking grinder for finishing OD concentric with PD prior to shaving teeth

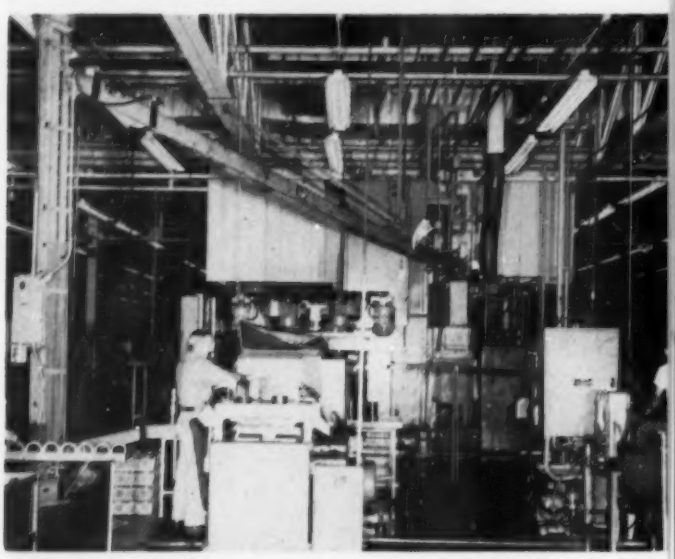


Final operation . . .
on kickdown annulus gear is finishing of teeth in special Fellows internal gear shaver equipped with a manually-fed automatic loader and unloader. Finished gear rings are manually transferred to passing hangers of overhead chain conveyor for delivery to heat-treating furnaces, then to speed testers

Shop-Made Automation Speeds Over-Running Cam Production



Forged rings . . .
for over-running cams are delivered to 6-in. capacity, 6-spindle Acme-Gridley chucker (left) by lift trucks in Powell Flow-Matic bins. Machined rings are placed manually in bin of adjacent Feedall elevator (center) for automatic feeding to Besley 2-spindle disk grinder (right) for automatic finishing of opposite faces

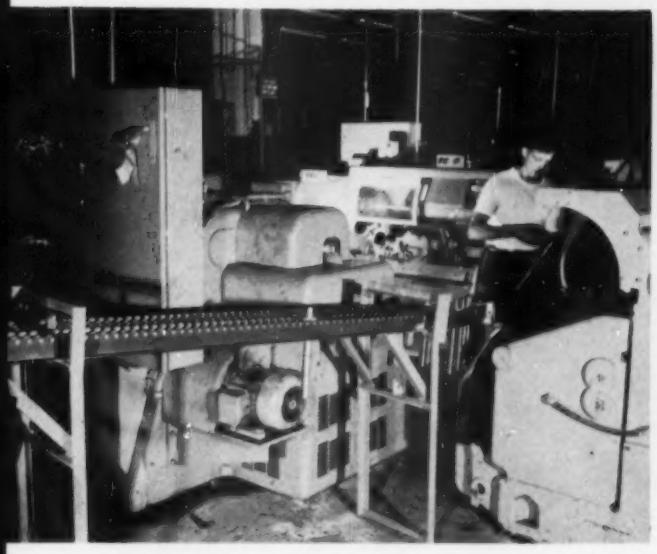


Over-running cam rings . . .
move by chute from grinder to manually loaded Heald 2-spindle Bore-Matic for precision finishing the bores. Then they are moved by elevator and overhead chute to fully-automatic 2-ram Detroit vertical broach for cutting cam lobes in bore. Rings are chuted next to Rehnberg-Jacobson machine (center background)

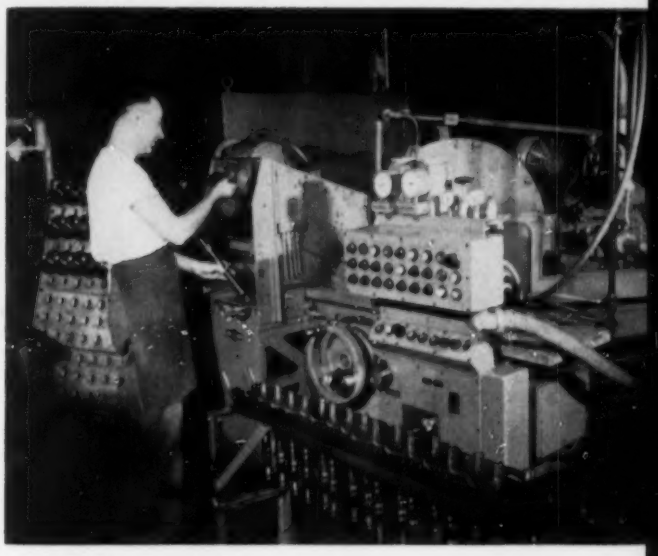
Drilled cam rings are heat treated . . .
chuted from washer to loading end of automatic furnace, along with over-running clutch hubs from another line, where they are stacked on racks for hardening, Marquenching, and drawing to 40 R_c. At unloading station (to right of loader), racks are dumped to Syntron feeders for delivery of parts to elevators

Induction hardening of lobes . . .
on hardened-and-drawn over-running cams. Chuted from furnace to special automatic Tocco unit (left), internal cam lobes are hardened to 60 R_c in 15-sec cycle. Clutch hubs move down skate-wheel chutes (top center) to two-position, fully-automatic Tocco unit where hub is hardened to 60 R_c in 15-sec cycle. Later, both parts are drawn in 400 F recirculating furnace in 1-hr cycle

Skate-wheel chutes move steel shafts



Input, intermediate, and output . . .
transmission shafts are turned on lathes arranged in groups of two or three for single-operator control of each group. Shafts move from group to group down skate-wheel chutes, with shafts supported by their flanges. Clamp-type holders are used with throwaway carbide bits wherever possible



Angle-head grinder . . .
fully-automatic Cincinnati, finishes 1¼-in. OD bearing fit and adjacent flange face on intermediate shafts at rate of 80 to 100 p r hr. Feeder now is loaded manually, later will be connected to conveyor system for fully automated operation. Gage controls machine operation, warns when wheel OD approaches minimum

Blasting deburrs CI and aluminum parts

Aluminum-alloy parts transferred . . .
in full hanger-loads from washer to Wheelabrator Shelblaster as shown. A 15-sec blast cycle eliminates almost all burrs, minimizing costly hand deburring. The two pellet-hurling wheels in each machine are driven at 2750 rpm by 15-hp motors. Indexing of compartments is automatic

Deburring is one of the most important, and at the same time, one of the most expensive operations in most automatic transmission plants.

Several important developments have helped solve this problem. One is the revision of designs for castings, particularly the CI case castings and the diecast aluminum-alloy valve and governor bodies, to have chamfers cast on faces and holes requiring machining in order to minimize or eliminate burrs formed during metalcutting operations.

Another line of attack has been to minimize hand deburring by mechanizing deburring operations where possible. Shotblasting of hardened steel parts for deburring is common practice. For softer CI and aluminum parts, mechanical blasting units with crushed nut-shell abrasives are the answer. This process has reduced hand deburring of diecast aluminum parts by at least 90%. It is almost as effective when used to deburr CI parts.

Soft-grit pellets generally are crushed apricot pits, crushed nut shells, or a mixture of the two. For work at Kokomo, crushed walnut shells have proved most satisfactory. At Kokomo, finer pellets than usual (20/30 mesh screens) have been found most desirable for finish-machined diecast aluminum valve and governor body parts to insure against damage of the finely-finished joint faces.

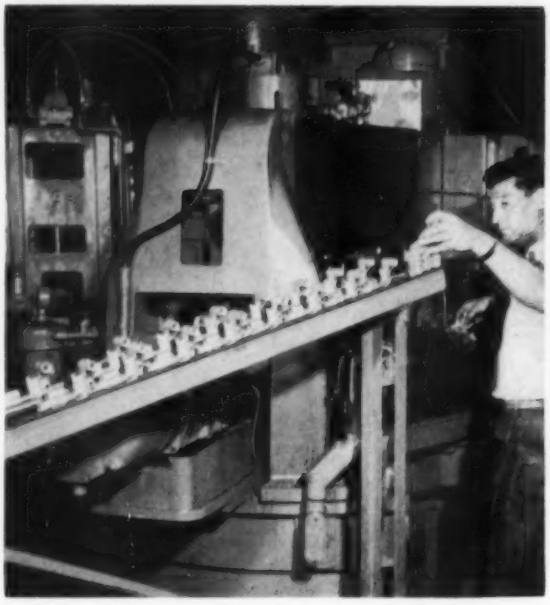
Diamond-tipped face mills finish aluminum valve bodies

Major problem when machining diecast aluminum valve and governor bodies for automatic hydraulic automobile transmissions is the development of smooth, flat, scratch-free mating faces, since no gaskets can be used in the assemblies and the joints must be leakproof.

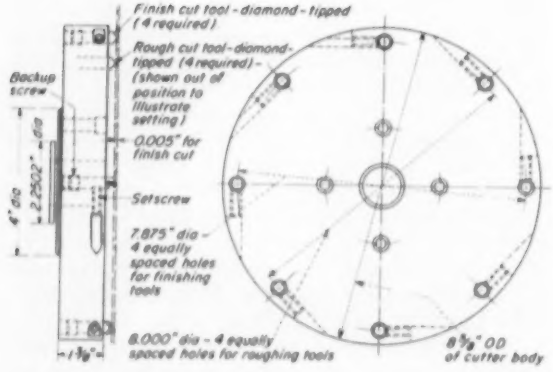
Usually these joint faces are finished by face-milling with carbide-tipped cutters, then lapping to achieve the required finish. Because lapping is a slow, expensive operation, tool engineers at the Torque-Flite plant in Kokomo have tried a number of methods to improve the quality of the as-milled surfaces.

Facing cutters using solid carbide bits (sketch) proved effective when milling the joint faces in special 4-station Kingsbury drilling and milling machines, and in special Heald trunnion-type opposed-spindle millers (photos), particularly when the four finish-carbide bits were ground with a negative 3° rake. But tool life was lower than desired—averaging 300 pieces per cutter grind—and surface finish achieved was somewhat rough, averaging 20 to 25 mu-in. rms.

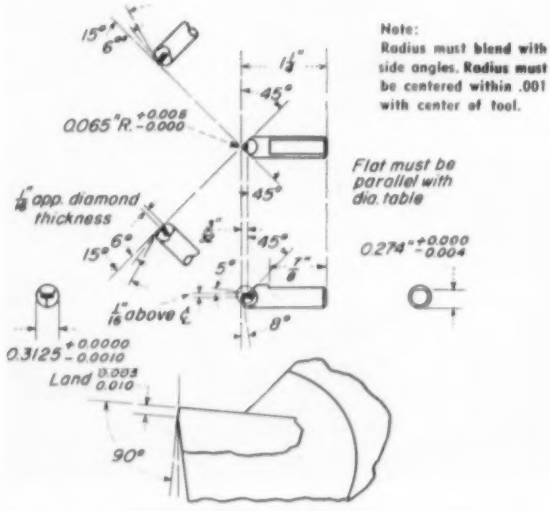
By using diamond-tipped bits instead of carbide bits, cutter life between grinds has been increased to approx 5000 pieces and finish averages 5 to 10 mu-in., virtually eliminating the finish lapping required to achieve the face surfaces required. Cutting speed was doubled, now is about 8000 fpm.



Quality of joint faces . . .
milled on diecast aluminum valve bodies in this 4-station special Kingsbury drilling, tapping, and milling machine was improved materially when diamond-tipped bits were substituted for the solid-carbide bits originally used for roughing and finishing cuts. Production per cutter grind was increased almost 20 times


Finish cut tool - diamond - tipped (4 required)
Rough cut tool - diamond-tipped (4 required) - (shown out of position to illustrate setting)
Backup screw
0.005" for finish cut
Setscrew
7.875" dia - 4 equally spaced holes for finishing tools
8.000" dia - 4 equally spaced holes for roughing tools
8⅜" OD of cutter body

Forged steel milling cutter . . .
for facing diecast aluminum valve and governor bodies is 8⅜-in. OD, 1⅝ in. thick. It carries four diamond-tipped roughing bits in holes on 8.000-in. circle and four finishing diamond-tipped bits on 7.875-in. circle, with finishing bits set 0.005-in. further out than the roughing bits. The eight bits are of equal length to maintain dynamic balance of the revolving cutter



Diamond inserts . . .
weighing ¾ to 1 carat are used in the finishing bits now used for finish facing diecast aluminum valve and governor bodies. Even though they cost about 20X that of carbide bits, they show almost 20X as much life between cutter sharpenings and produce much finer surface finishes, eliminating need for lapping

INGERSOLL
Replacement Blades
FOR SUPERIOR PERFORMANCE & ECONOMY

Write for Cutter Catalog 66K describing Ingersoll inserted blade face mills, end mills, helical slab mills, side mills, arbor cutters and boring heads.

Good cutting tools require high quality blades. Ingersoll milling and boring cutters give you unequalled performance when equipped with Ingersoll replacement blades. In Ingersoll precision blades you get . . .

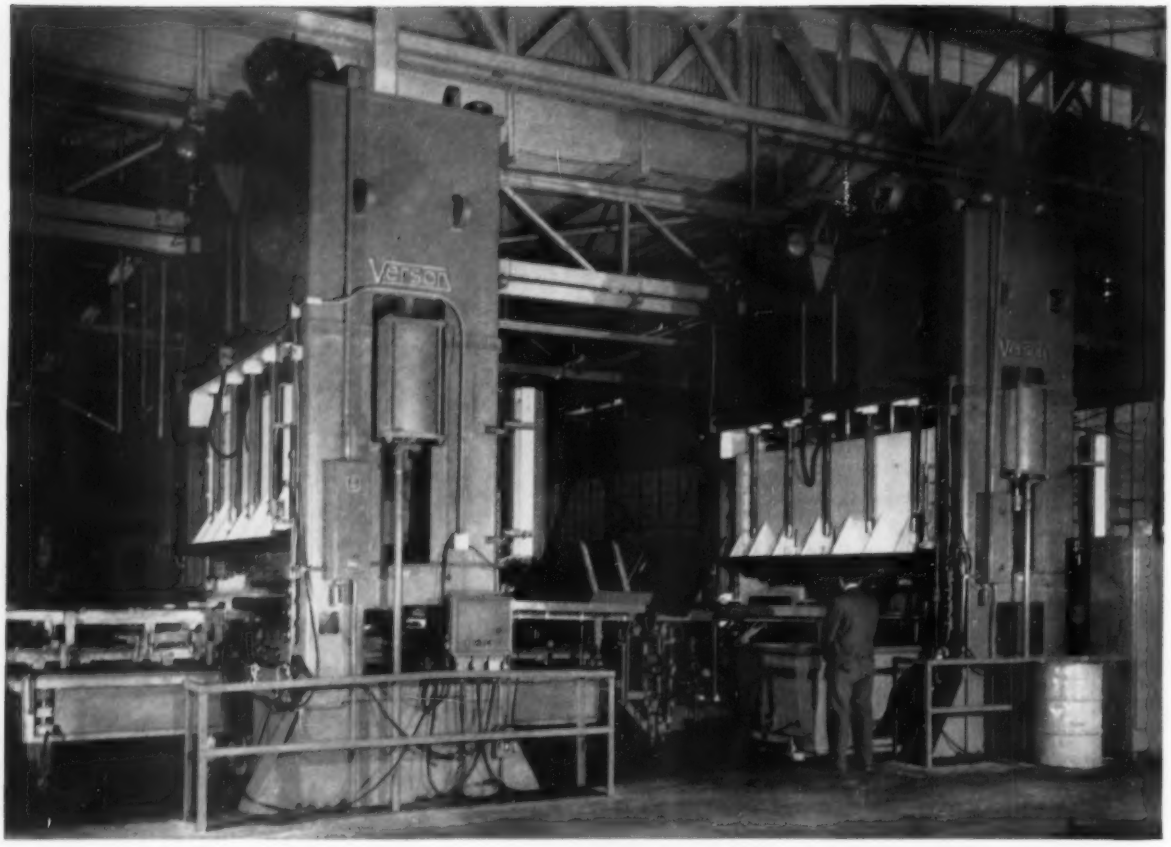
- **Special design** to give longer actual cutting life and more grinds per blade.
- **Manufacturing accuracy** to assure proper fit in cutter housing and more effective cutting action.
- **Selected grades** and correct arrangement of carbide for your particular work.
- **Benefits of continuous research** into new metal cutting techniques.

Because they are manufactured on modern, efficient production equipment, superior Ingersoll replacement blades are available at competitive prices.

Most standard Ingersoll carbide-tipped, cast alloy or high speed steel blades are available from stock.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U. S. A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS



Two 400 ton Verson Presses

perform as one production unit to manufacture automatic dryer bodies

Catalog G-56 describes the entire Verson line and gives design details and specifications. Write for your copy, today.

The two 400 ton Verson eccentric presses shown above, integrated with automatic handling equipment and controlled by one operator, perform as a single production unit in the manufacture of automatic clothes dryer bodies for a leading appliance manufacturer. The press on the left blanks and forms the dryer body and draws the front face with door opening. The parts then move automatically to the press on the right for flanging and punching operations. Speed is 14 strokes per minute.

Verson presses are engineered to become an integral part of the production process in which they are used. If you make stampings of any kind, this approach to your problems can mean big savings. Send an outline of your requirements today and put real production know-how to work for *you!*

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

PROFILE TURNING SLIDE . . . I

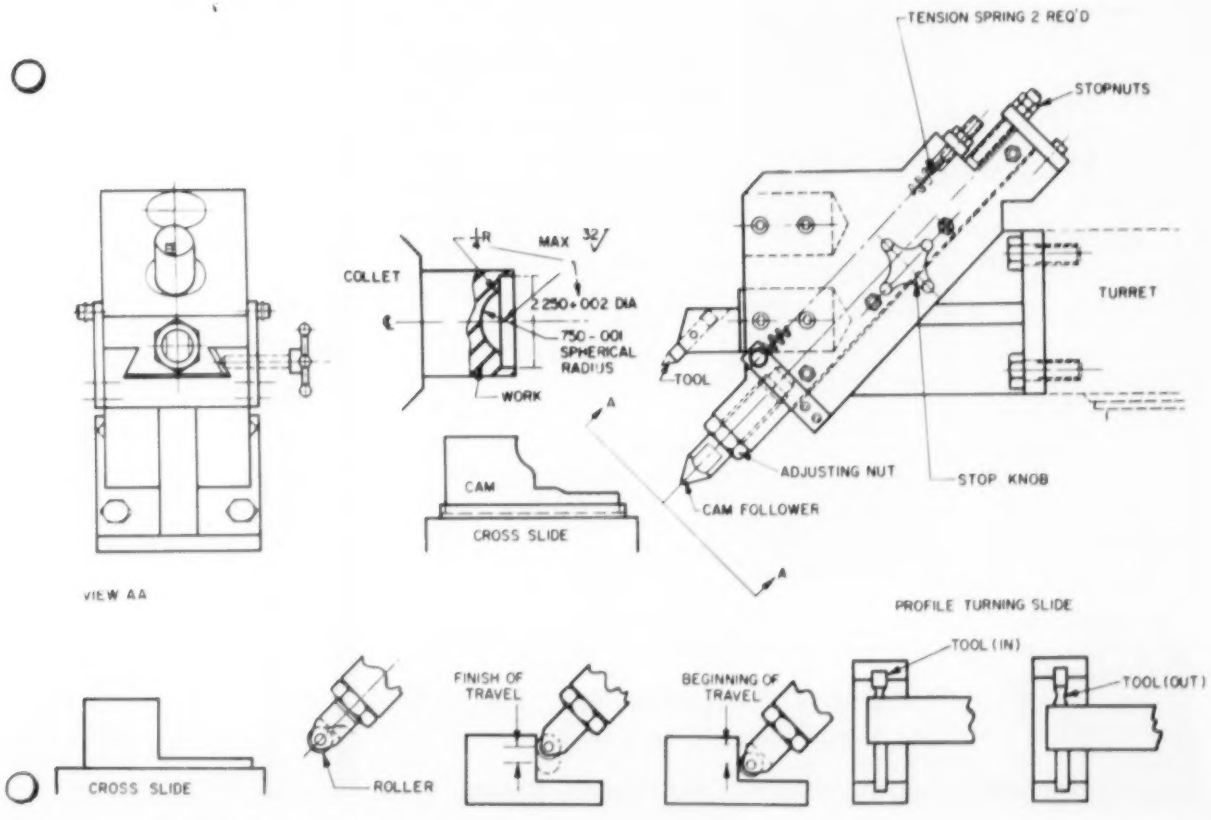
S R ROSEN, chief engineer, U S AUTOMATIC CORP, AMHERST, OHIO

This subject represents the author's third award from the Technical Papers Subcommittee of the National Screw Machine Products Association.

The profile turning slide (see page 165) was originally designed for the specific job of single-point cutting of a ball seat. Once that job was completed, other uses were sought for the tool. Since then it has had broad application in the U S Automatic plant. Now regarded at the plant as a standard tool, it is used particularly for short-run jobs which require both close tolerances and good finishes.

When the slide is to be used, it is mounted on the turret under a 45° angle. Either of two places can be used for the placement of the tool, depending on the part to be made. The cam follower is then screwed in the upper slide which is spring loaded; the downward travel is limited by two stop nuts. The cam itself is secured in a fixture of the cross-slide.

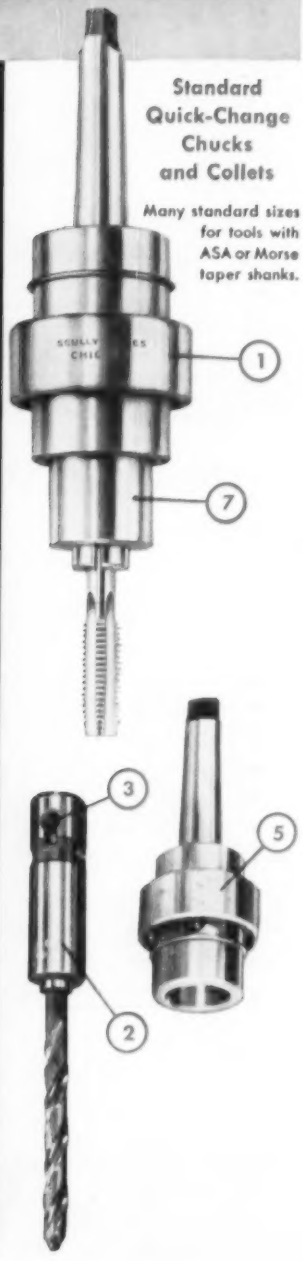
In preparing the unit for operation, the job must be set up so that the tool starts cutting on the bottom of the part and the cutting is continued until the tool reaches the center. When the center is reached, a stop knob halts the operation, the slide is locked, and the turret moved away. The tool is then ready for the next cycle after the stop



SCULLY-JONES QUICK-CHANGE CHUCKS AND COLLETS

ASSURE GREATER OVER-ALL ECONOMY FROM YOUR MACHINES AND CUTTING TOOLS

These benefits	..for these reasons	...result from these PREMIUM features
INCREASE PRODUCTION	Change tools fast without stopping the machine.	1. Operator merely lifts locking ring, without stopping machine, and the collet with cutting tool drops out.
		2. Operator inserts replacement collet in one easy motion. Ring falls into place by gravity, and machine is ready for next operation.
	Faster, easier ejection of cutting tools from collet.	3. Exclusive keyhole-type drift slot permits ejection of tools by a simple twist of the wrist, using "Scully-Drift" or cam-type tool ejector.
REDUCE CAPITAL AND OPERATING COSTS	Minimize investment in special machinery.	4. Give multiple-spindle range to single-spindle machines used for sequence operations like drilling, counterboring, reaming, and tapping.
	Eliminate rejects.	5. Locking ring holds collet firmly and securely in chuck, providing a positive drive to the two balls which are the driving mechanism.
	Reduce maintenance and replacement costs.	6. Chucks are heat-treated and ground to prevent distortion and "nicking."
ASSURE SAFE OPERATING CONDITIONS	Eliminate safety hazards.	7. No ears or sharp edges on locking ring, and ample projection of collet, eliminate possible injury to operator when changing tools in motion.



Standard Quick-Change Chucks and Collets

Many standard sizes for tools with ASA or Morse taper shanks.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1909 South Rockwell St., Chicago 8, Ill.

PROFILE TURNING SLIDE . . . II

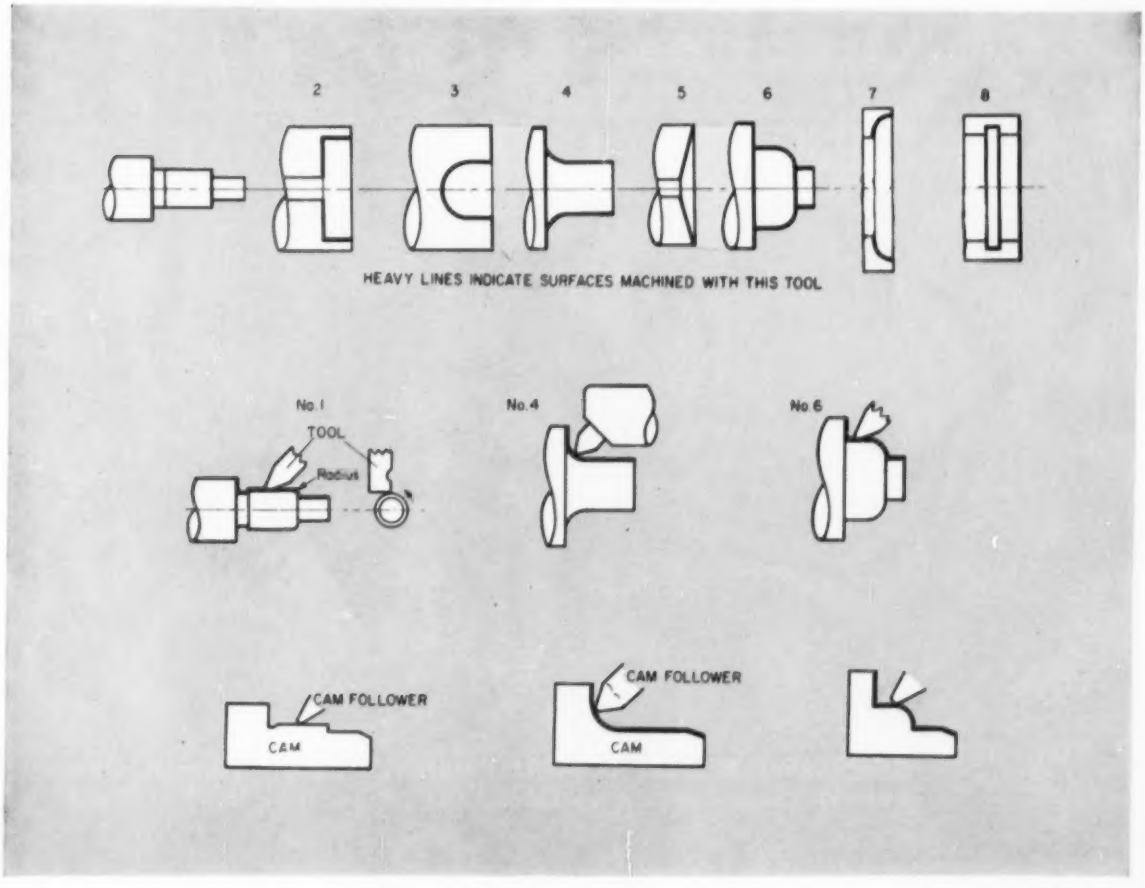
knob is released by the operator.

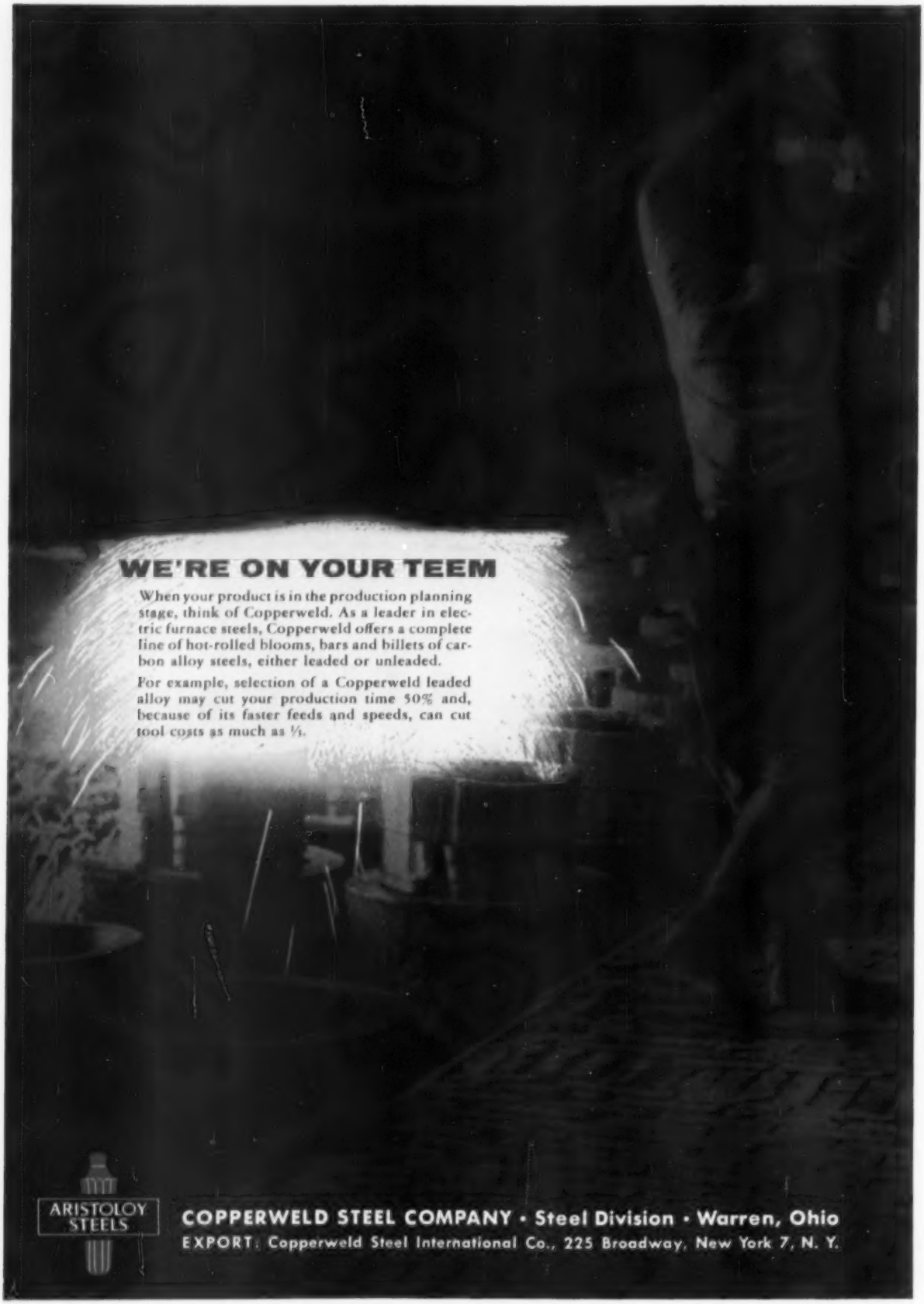
In one instance, however, the slide should not be locked while moving away with the turret. This is in the case of "O"-ring grooves. The reason for not locking, in this instance, is that the slide is permitted to lower.

One distinctive difference should be noted between internal and external profile turning. In the case of the former, the cam confirms the outlines of the internal profile, and the tool is set in a boring bar just as a regular boring tool would be. However, in the case of external profile turning, the cutting tool is similar to a knee tool and the cam corresponds to the profile of the upper portion of the work.

The cam, in the case of grooving, consists only of a straight vertical block. This is illustrated in the drawings representing two different views, the beginning of the travel and the finish of the travel for internal grooves. It can be noted from the drawings that while backing up the hex turret, the grooving tool clears down to the end of the pre-set slide limit and then moves out.

The various types of work that are possible with the profile turning slide are also illustrated in the series of drawings.




WE'RE ON YOUR TEEM
When your product is in the production planning stage, think of Copperweld. As a leader in electric furnace steels, Copperweld offers a complete line of hot-rolled blooms, bars and billets of carbon alloy steels, either leaded or unleaded.
For example, selection of a Copperweld leaded alloy may cut your production time 50% and, because of its faster feeds and speeds, can cut tool costs as much as ⅓.
ARISTOLOY STEELS
COPPERWELD STEEL COMPANY • Steel Division • Warren, Ohio
EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

MILLING TITANIUM WITH CARBIDE

JOHN BEGLE, director of research, DETROIT MILLING CUTTER CO, FARMINGTON, MICH

A titanium milling chip is long in relation to tool travel, indicating a large, efficient shear angle. But machinability is not good. The primary problem is generation of much heat as the long chip slides rapidly over the tool. Titanium has a poor heat-dissipation rate. These two circumstances result in high temperatures at chip-tool contact. Because titanium at elevated temperatures has a high affinity for other metals, the chip welds to the tool.

Generation of heat drops off with reduction in cutting speed, but even at the lowest practical milling speed the heat is still sufficient to cause welding of the chip to the tool. The chip is carried around with the tool, strikes the workpiece on the next entrance, and the shock tears off the welded chip, taking a portion of the cutting edge with it. Rapid tool failure results.

Heat can be reduced by increasing the chip thickness. The heat generated by the friction of one thick chip rubbing on the tool face is less than from two thin chips. Further, the thick chip has more mass to dissipate heat. Tests show that welding can be reduced but not overcome, even with a chip load of 0.02 ipt. Tool failure still results.

PRACTICAL SOLUTION

By using a round tool, the chip formed at a given depth of cut will be flattened considerably (Fig 1). Width of chip will equal the length of arc shown. Similar results can be obtained with a tool with 45° chamfer. Further thinning of the chip can be secured by climb milling, using a large-diameter cutter positioned so that tools leave the work with a chip thickness approaching zero (Fig 2).

Advantages of this setup are: first, the wider chip spreads the heat over a greater area of the tool face; and second, the tissue-thin end of the chip is either thrown off by the cutter or easily sheared when reentering the work. Therefore, welding and chipping are overcome. Minor flank wear occurs, but the cutting speed can be safely increased to 475-525 fpm.

Precaution: The long, wide and thin chips tend to pack in the chip pockets of the cutter; hence, larger clearance than usual should be employed when milling titanium. Greater tool overhang than normal will help control chip packing and will do no harm.

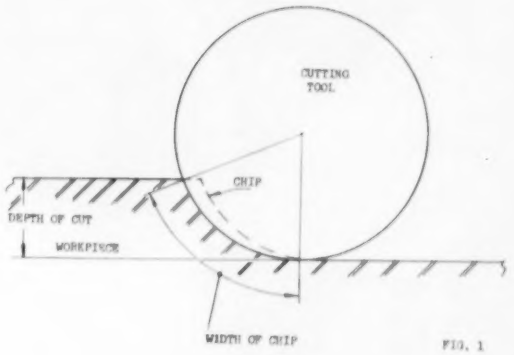


Fig. 1

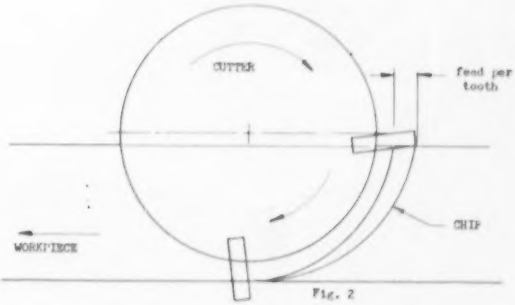


Fig. 2

PRODUCTION RUN—Material, titanium alloy (6% aluminum, 4% vanadium, 0.10% carbon.) Workpiece, 2 x 3 x 6½ in. Job to remove ¼ in. from each of two adjacent sides, milling along the 6½ in. length. Machine—40 hp planer-type miller with dc milling head for variable spindle speed. Cutter—6 in. dia, 8-tooth, blades 1 in. rd x 3/16 tungsten carbide, cast-iron grade; top rake –7°, side rake –7°. Speed—471 sfpm. Feed—0.005 ipt. or 12 ipm.

The spindle receives 6.6 hp at the above speed, limiting the depth of cut to 0.110 in. on the 3-in. face of the work. Rate of metal removal is 0.6 cu in. per hp-min., dropping to 0.4 cu. in. per hp-min. as the blades dull. Blade failure occurs at 0.03 in. flank wear after 52 milling cuts. Three cuts per side were made, or six in all, giving 4 pc per hr. An excellent bright surface finish was secured.

Heavy sparking occurs near the end of blade life, making it advisable to index blades even though maximum 0.03-in. flank wear has not been reached.

TUBING

every kind in stock

- Seamless Mechanical
- Welded Mechanical
- Fluid Power Tubing
- Structural Tubing
- Boiler Tubes
- Stainless Steel Tubing

You'll get quick delivery on steel tubing for every purpose from Ryerson. The nation's largest tubing stocks —fast, accurate cutting service . . and an experienced staff of tubing specialists—all are at your command.

So call Ryerson for everything in tubing and tubing service, whatever kind or quantity you need.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloy and stainless steel, reinforcing bars, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop . . .

Outdoor Working

IT'S HARD for an editor from the north to get used to a common practice in the Southwest and West—that of putting a shop out in the open. This country is basically desert, made to bloom by irrigation. Rainfall is so infrequent, and temperature so seldom uncomfortably low, that a shed roof to keep off the sun sometimes does it. Convair-San Diego has a complete setup for "dynamic etching" under a high roof, frequently uncrates new equipment and cleans it up or assembles it out in the open. Solar Aircraft, still farther south at Chula Vista, does some operations outside. McCulloch Motors, Los Angeles, during a rearrangement last Spring, moved most of the heat-treat units out into the yard—and kept right on operating. Even in Huntington, W Va, ACF does some car-building operations outside. Cuts building costs away down.

Shaving?

BURROUGHS CORPORATION, Detroit, fired a man for shaving on the job, because a foreman saw him in the washroom with lather on his face. Asserting he had really been fired for his activities as a UAW organizer, Demetrios Koutsimbas, 31, applied for unemployment compensation—a plea that was fought by Burroughs. At the hearing, Koutsimbas showed up with a 4-day growth of heavy beard—and proceeded to shave the whiskers off with no more assistance than a sharp blade and a little warm water. This blasted the lather-on-the-face testimony of his one-time employer, so he got his money. That's $1300 for a latherless shave.

Eh, What's That?

CATERPILLAR employees at Peoria, Ill, are taking part in a 4-mo hearing-testing survey for the Graduate School of Public Health, Univ of Pittsburgh. Some 1000 employees will be involved, in a wide range of ages and jobs. They will be tested periodically for the next five years, to determine, if possible, the level at which sound can cause measurable effect on human hearing. Caterpillar has been testing sounds as part of its medical program since 1950, but this is a much more intensive job than has been done previously.

On the Spot

TRANSITS and collimators for fixture work at Chance-Vought, Dallas, Tex, are often pointed into relatively dark corners. Various types of lights were tried, but the finally successful one comes from the automotive field. An auto spotlight is clamped to the base, just below the instrument. The light is complete with operating handle, and powered by a 6-volt transformer at the foot. Thus the instrument operator puts light just where he's looking—or if he doesn't, it's his own headache.

Pity the Poor Sub

SUBCONTRACTORS are desirable, say the military; the policy avoids the single source for a strategic item. But the thinking isn't all clear yet, because the sub and the prime contractors don't always see eye to eye. A major problem, for example, of the subcontractor working for more than one principal is the fact that every prime has different standards, different tolerances, different procedures. The sub must literally set up a special shop to handle each contract, a shop skilled in the procedures of the particular prime contractor. That goes in reading drawings, in handling machining and forming—but particularly in heat-treating the tricky new alloys.

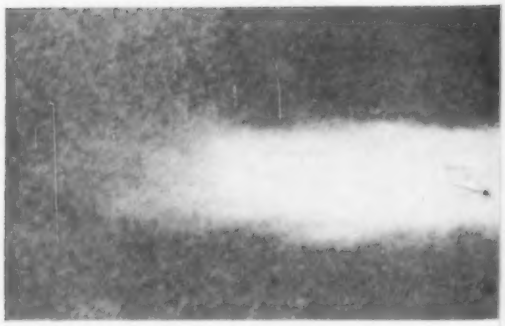
After Superalloys What?

NOW THAT THE SUPERALLOYS seem well established for operations in the 1200 to 1800 F range, the researchers are bending their effort to the search for materials to fit the next niche in the high-temperature scale. Molybdenum alloys are one possibility (see Special Report No. 431 *et seq*) but the refractory hard metals hold other possibilities. In a symposium dedicating Union Carbide's Parma (Ohio) Research Lab, Prof Searcy of California reported on the promising silicides. Scientists are seeking oxidation resistance comparable with molybdenum disilicide but with better shock resistance and ductility. Results can be expected only from the high-silicon phases of a few rare metals. If you think you have trouble with some of the materials you work today, just wait.

Move Tools, Save Men

"WE CAN MOVE 100 machines for $5000—so if moving that many will save the cost of one operator the move will pay for itself in a year. And we usually figure that a move that big will save many more than that. Under the circumstances, you can bet we move machines frequently." This philosophy was expersed by a West Coast shop superintendent with a record for real efficiency. It's worth pondering; we saw it work.

Guided Missiles



Here's What They'll Mean to

WASHINGTON—The military guided missile program—in which at least $7 billion has been invested over the last decade—is the only defense program with heavy rising costs. While other programs—aircraft, ships, vehicles, and the like—are being cut back or at least stabilized, the outlook for missiles is for yearly boosts of about 20% in new contract awards and expenditures during the near future.

For one thing, eight different missiles have become operational and are now in heavy-volume production; and at least six others are just going into production. Then, too, at least six other missile research projects—and the more costly ones at that—are getting into the hardware stage: components are being fabricated, prototypes of the entire missile are getting assembled.

Boom for Metalworking

To metalworking industries, all these add up to a booming market in defense business:

- As prime contractors or subs on production or research and development projects; or
- As suppliers of machine tools and other high precision production equipment.

This year, the Defense Dept plans to award $2,478 million worth of new orders for missile procurement and production, $224.2 million for research and development. In fiscal 1956, the totals were $1,798 million for procurement, $267.9 million for R&D. The fiscal 1957 appropriation allowed $1,776 million for missile procurement and $199 million for R&D—compared to $938 million for procurement in 1956 and $231.3 million for R&D.

Meantime, expenditures will come to $1,276 million for missile procurement this year—only slightly more than 10% of total military hardware procurement. Although it's a new record spending figure for missiles, it's still below the new contract award and new appropriation sums—which show up the rising trend for missile expenditures. Another indicator: missiles make up about 20% of the total military R&D program—the biggest chunk.

ICBM's Are Costliest

Most costly of the projects is the Air Force's Intercontinental Ballistic Missile (ICBM). One educated guess has it that project expenditures—much of it financed from production funds although the project is still in the development stage—will come to $582.8 million this year, compared to $421.8 million in 1956 and $179.5 million in 1955. General Dynamics Corp's Convair Division has a development contract for the airframe and airframe components for the Atlas ICBM, Glenn L Martin Co for the Titan ICBM—another configuration for the 5000-mile missile. About 100 other companies are developing the guidance system, propulsion and other sub-systems.

Fast Tax Writeoffs

Up to now, the Office of Defense Mobilization has granted about 50 fast tax amortization certificates on plant expansion costing about $200 million for missile facilities. Of this sum, an average 65% was covered by accelerated amortization. Roughly 75% of the funds are earmarked for equipment, the remainder for construction.

But ODM officials say this doesn't really tell the whole picture of missile-stimulated plant expansion since lots of other new defense facilities—aircraft and electronics—are probably interchangeable with missile operations.

"A New End-Product"

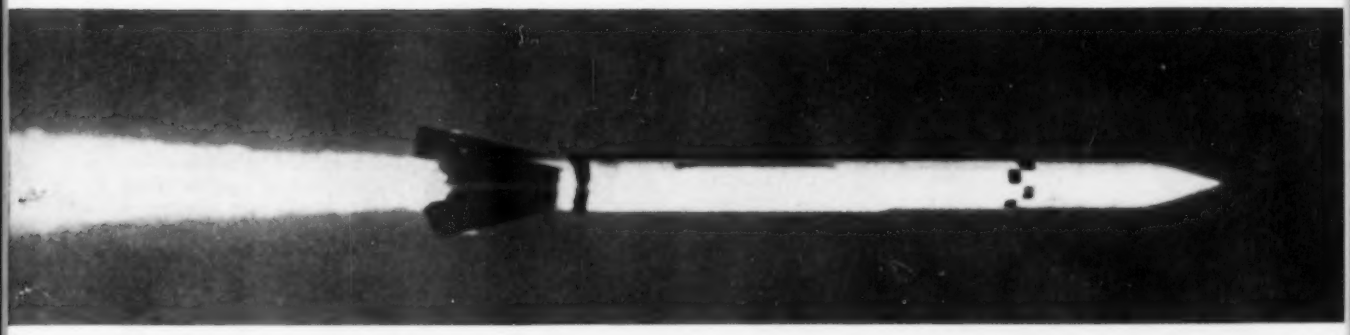
Defense officials like to pooh-pooh the idea that a "new industry" has sprung up in missiles. Their view is that the missile itself is a "new end-product" developed by established industries—guidance, airframe, propulsion, and controls producers.

This is apparent when you look at the names of the top contractors. Each of the top 35 military contractors in 1955 is up to its neck in missile business—and each is well established in an old-line field: Boeing, North American Aviation, General Dynamics, United Aircraft, General Electric, AT&T, Ford Motor, Lockheed, Curtiss-Wright, Douglas Aircraft, and so on.

Small Business Is In It, Too

But it can be said that an army of small firms have gone into business just to get their hands on government missile work. For the most part, these are companies with development subcontracts set up by men with lots of technical know-how acquired in the established fields allied to missiles.

It's hard to say which companies have the largest missile order backlogs. Exact figures of this sort are



Army's surface-to-surface "Corporal"

Defense Metalworking

classified by the Pentagon. However, a look at the cumulative listing of top military contractors since July 1950 shows that most if not all the hard goods producers are in missile work.

Contractors Are Legion

It is equally difficult to say how many companies have prime or subcontracts. Note how the 1955-56 buyers guide of *Aviation Week*, a McGraw-Hill publication, lists established manufacturers of missiles and major components:

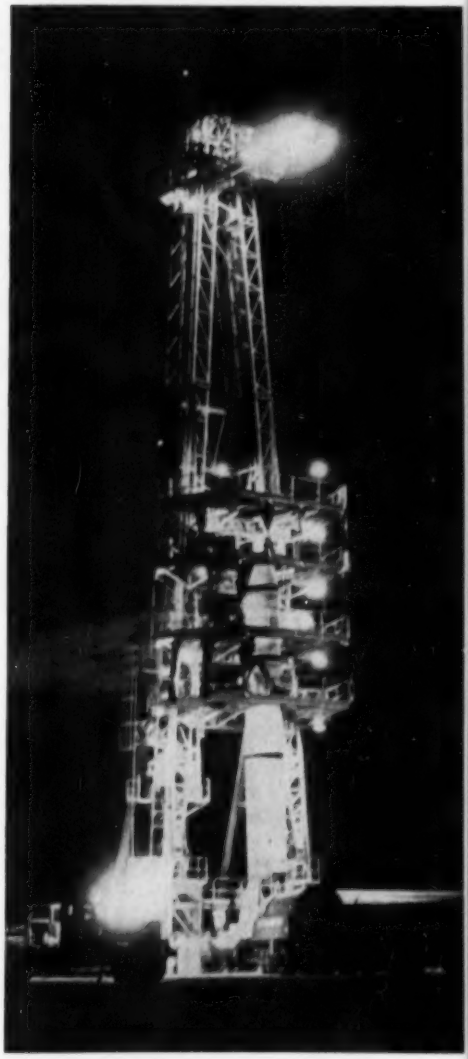
• Accelerometers—42 companies; afterburners—15; aftercoolers—10; air adapters (gas turbine engines)—2; airframes—52; airframe components—78; amplidynes—5; automatic pilots (electronic)—23; automatic pilots (hydraulic)—9; compressor blades (gas turbine engines)—25; missile boosters—7; combustors—7; compressor assemblies (gas turbine engine)—13; control assemblies—56; engine controls—28; engine accessories and components—54; gas turbine engines—17; pulse-jet engines—5; ramjet engines—8; rocket engines—11; fabricators of large sheet metal parts (wings, fuselages, tail surface, etc)—67; fabricators of small sheet metal parts—146; airborne ignition systems—12; airborne rocket launchers—16; ground-base missile launchers—20; missiles—37; rocket engine starters—4; fuel tanks—63; tracking & testing equipment—9; air turbines—14.

In recent months, guided missiles have gotten into politics. A full-dress Senate investigation headed by Senator Stuart Symington (D, Mo), the Truman administration's Secretary of the Air Force, was made of the program this spring. A report is due shortly. The probe was prompted by charges made by Symington and others that the U S lags behind Russia in developing a strategic, ocean-spanning ballistic missile because of the administration's military budget cutbacks.

Most experts believe the U S leads in producing short-range tactical and anti-aircraft guided missiles. But another matter is the long-range ballistic missile—the so-called "ultimate weapon"—which is launched into outer space by one or more rocket motors which are eventually jettisoned; the momentum carries the missile in an arc hundreds of miles above the earth and gives it a bullet-like trajectory that will plunge it down on target at many times the speed of sound. The state of U S progress on this type of missile is enmeshed in controversy. Rep George H Mahon (D, Tex), who as chairman of the House Military Appropriations Subcommittee is close to the scene, reflects the views of many experts. "No one can prove with complete accuracy who's ahead on ballistic missiles," he says. "Neither Russia nor the U S has an effective intermediate-range ballistic missile (IRBM) or an intercontinental ballistic missile (ICBM), so it's hard to evaluate."

40 Projects Underway

The three military services now have about 40 missile projects under way. The projects range in type from air-to-underwater to the 5000-mile ICBM. In status, they range from initial research—like anti-missile mis-



Army's "Redstone" . . .
is fueled, maintained from this servicing structure at Patrick AFB, Florida. The "service station" automatically rolls away if anything goes wrong during fueling

siles—to heavy-volume production and operational use.

For many tactical missions, the guided missile is starting to displace conventional anti-aircraft and field artillery, naval guns, and aircraft armament. But the age of total push-button warfare—where you would see defense surface-to-air missiles knocking ICBM's out of the sky—is not just around the corner. Few seriously believe that manned aircraft or conventional cannon are about to be dumped on the scrap heap.

In Its Infancy

The guided missile is still pretty much in its infancy. The state of its art is comparable to that of bomber aircraft until mid-World War II. A retired Air Force general puts it this way: "It wasn't until 1943 that we were fully convinced bombers were economically effective. Only then were we sure that the damage inflicted on the enemy by our bombers was more than our costs of producing the planes. Guided missiles are at the same stage now. None has been proven in a true operational sense. They've been tested only under a fictitious set of conditions. How fast these kids will grow out of infancy, we don't know. But the faster we get them in operation, the more confident we can be about their role in any future war."

Hypersonic Test Vehicle . . . developed by the Air Research and Development Command reaches nearly seven times the speed of sound in 2 seconds. It's a free-flight research tool to gather hypersonic research data on rocket shapes, heating, stability and air pressures

For the future war, the U S now has an arsenal of operational missiles consisting of:

• The Army's *Nike*, a one-ton, anti-aircraft missile produced by Western Electric Co and Douglas Aircraft Co. Guided by radar and travelling at Mach 2 speeds, it's designed to hit enemy planes regardless of evasive tactics within a range of about 25 miles; is launched by a Hercules Powder Co solid-propellant rocket booster which quickly drops from the missile, is then powered by an Aerojet-General Corp liquid-propellant rocket; has been set up at over 125 sites ringing at least 17 important cities.

• The Navy's *Terrier*, a ship-launched anti-aircraft missile with a range of about 20 miles, produced by General Dynamics Corp's Convair Division. Like *Nike*, it's launched by a solid-propellant rocket, is then powered by its own liquid-propellant rocket motor.

• The Navy's *Sparrow*, a small air-to-air missile, produced by Sperry Gyroscope Co and Douglas for carrier-based jet fighters; is powered by a solid-propellant rocket, hits speeds of Mach 3. Douglas and Raytheon Manufacturing Co are working on improved models.

• The Air Force's *Falcon*, a 100-lb missile carried by land-based supersonic aircraft, produced by Hughes Aircraft Co, has a five-mile range, is the latest missile to become operational.

• The Army's *Corporal*, designed by California Institute of Technology and produced by Firestone Tire & Rubber Co; is a monstrous missile (40 ft long, 12,000 lbs); fires a nuclear warhead up to 50 miles—almost four times the range of the new 280-mm atomic cannon—is powered by a liquid-propellant rocket; has a guidance system precise enough to hit concentrated tactical targets.

• The Navy's *Regulus*, 2,500-lbs heavier than the *Corporal* and almost twice as wide; is fired from surfaced submarines and other ships against land targets; is produced by Chance Vought Aircraft Inc; looks like a conventional swept-wing jet fighter; is a two-stage rocket—launched by two solid-propellant rockets, powered by a GM-Allison turbojet engine. An improved model, powered by General Electric's J-79 engine, will be supersonic.

• The Air Force's *Matador*, a surface-to-surface missile, takes off from a fixed launcher with a one-rocket booster that puts it on its course; has a sustaining motor—similar to *Regulus'*—that carries it up to 600 miles at subsonic speeds; is produced by Glenn L Martin Co.

• The Navy's *Petrel*, an air-to-surface missile, launched by patrol planes well outside the range of the target's air defense; used mainly for anti-sub operations; powered by a J-44 jet engine; is produced by Fairchild Engine & Airplane Corp.

New Types on Way

These are backed up by several other missiles just coming into production. Among the outstanding ones: (1) the Air Force's *Rascal* air-to-surface missile, produced by Bell Aircraft Co; (2) the Navy's surface-to-air *Talos*, produced by McDonnell Aircraft Co, with a range far beyond *Nike* and *Terrier;* (3) the Army's *Redstone*, a 250-mile tactical ballistic missile produced by Chrysler Corp, an updated version of the German V-2 rocket.

The Defense Dept recently announced that the Air Force will be allowed to set up *Talos* missile sites to provide anti-aircraft defense for four of its Strategic Air Command bases. The action played up some serious inter-service squabbling which many experts believe is slowing down missile development. The Army, whose traditional mission is to provide anti-aircraft defense—with conventional ack-ack guns and the *Nike* guided missile—complains bitterly that Air Force operation of *Talos* would be an invasion of an Army mission. The Navy originally developed *Talos* as a ship-launched missile.

The inter-service missile rivalry is even more pronounced in strategic ballistic missiles. The Air Force runs the ICBM program—with two projects in the works, Convair's *Atlas* and Martin's *Titan*, which will have different configurations but essentially the same components.

Each of the services is pushing for a 1500-mile IRBM. The Air Force's project is the Douglas *Thor*. The Army and Navy have a joint IRBM project with research centered at the Redstone Ordnance Arsenal at Huntsville, Ala. Chrysler is tied into it as manufacturer.

The Ramo-Wooldridge Corp pulls the strings together on the Air Force ballistic missile projects by furnishing "system engineering and technical direction to more than a dozen major contractors."

The propulsion problem has been pretty well licked in developing the long-range ballistic missile. Less advanced is the production of a guidance system. But the major snag is producing a nose-cone and warhead which can survive the tensions of re-entry into the atmosphere at speeds close to 16,000 mph.

Because technology will stretch out development time for the operational ICBM, the Air Force is also developing slower-and-lower flying, air-breathing guided missiles which have intercontinental ranges:

• Northrop Aircraft's *Snark*, now in prototype, was originally scheduled for operation by 1958. It is a cruise-type missile—with wings like an airplane it must fly under its own power until it begins its final dive on the target. It is powered by a single jet engine of at least 10,000 lb thrust and flies about 600 mph at 40,000 ft. Decision on whether to put the *Snark* into large-volume production is being held up. Some Air Force officials are reluctant to invest heavily in the *Snark* because it is a subsonic missile which could be intercepted fairly easily.

• North American Aviation's *Navaho*, like *Snark*, is basically a pilotless bomber. Still in research, it will fly at about Mach 2.5 at altitudes of at least 75,000 ft. It will be powered by a ramjet engine, but will probably use a jettisonable rocket booster to get it into the air and to reach speeds where the ramjet can take over. *Navaho* is bigger than the 32 x 4½ ft *Snark*, is designed for the same range.

To pull the strings together on this wide-ranging program, Defense Secretary Charles E Wilson recently named Eger V Murphree, president of Esso Research and Engineering Co, to be his Special Assistant for Guided Missiles. Murphree's job is to "direct and coordinate" research, development, engineering, and production—particularly of strategic ballistic missiles.

Murphree's appointment was meant to take some of the sting out of the charge that there was no Pentagon official on a Secretary or near-Secretary level who put in full-time on missile work.

Marines' land- or ship-based "Terrier"

Navy's air-to-air "Sidewinder"

Army's "oversized artillery rocket"—"Honest John"

Engineered Tool Salesmanship Urged

COLORADO SPRINGS, COLO—The sales engineering and service that make possible automated production cannot be done by push-button or remote control. The essential job of putting new industrial machinery and tools to proper use in shops can only be accomplished by a highly-skilled distribution force.

That was the theme of the remarks by Henry Hanson, president of the American Machine Tool Distributors' Association and vice president of the William K Stamets Co, at the AMTDA's 32nd annual meeting at The Broadmoor October 15-16. For the next 10 years, he said, the shortage of industrial production engineers must be partially offset by greater reliance upon and wider use of the readily available nationwide force of distribution sales and service engineers. Capital equipment producers are finding that outside distributors can help them free more engineers for important development and production assignments.

"Nearly every day," Mr Hanson said, "useful new industrial tools and products fail to find their proper markets or reach their full potential because their builders do not have the sales engineering staffs needed to sell them to industry or because enough engineers cannot be spared from development or production work."

Mr Hanson predicted that industry's use of distributors will grow steadily if machine tool and other distribution groups continue to demonstrate that they are capable of expanding their own sales engineering skill, resources and facilities.

Reporting on the activities of AMTDA's Government Relations Committee, Chairman R A Vidinghoff of Machinery Associates Inc, Wynnewood, Pa, said the AMTDA Sub-Committee on Taxation has been "following with interest" the question of tax liabilities of leases and conditional sales contracts for machine tools. A new Treasury ruling has been developed and two court cases have come up, Mr Vidinghoff said, but unfortunately they have been contradictory. However, it appears that any lease which contains a purchase option, or an unstated but obvious purchase intent, will be carefully scrutinized by the Treasury Dept. And it may be classed as a sale with extended time payments.

One of the highlights of the two-day program was a skit, "A Sales Meeting," in which Charles B Tansley, president of Bryant Machinery & Engineering Co, Chicago, played the role of sales manager, with George K Cassady of Giddings & Lewis as a builder, and J J Fuchs of Fuchs Machinery & Supply Co, Omaha; Spencer B Booz of Federal Machinery Sales Co, Chicago; Manus Campbell of Peninsular Machinery Co, Detroit; and E P Ferguson, Jr, of Joseph Monahan Co, Grand Rapids, Mich, as salesmen.

Closing event of the meeting was a panel on "Sales Promotion and Advertising" geared to the needs of the machine tool distributor on a local level, with R M Skallerup of Waldie & Briggs, Chicago advertising agency, as moderator. The panelists: William B Herbert of Cinrock Machinery Inc, Clifton, N J; Joseph T Vinbury, Abrasive Machine Tool Co, East Providence, R I; I B Rabel, Star Machinery Co, Seattle, Wash; and Harvey E Hallenberg, E L Essley Machinery Co, Chicago.

New officers and executive committee members elected for the coming year are: President, Joseph F Owens, Jr, J F Owens Machinery Co, Syracuse, N Y; First Vice President, Frank H Habicht, Marshall & Huschart Machinery Co, Chicago; Second Vice President, J O Ellison, Harron, Rickard & McCone Co, San Francisco; and Secretary-Treasurer J Russell Clark, White Star Machinery & Supply Co, Wichita, Kan. New executive committee members: C Denson Day of Machinery Associates Inc, Wynnewood, Pa; B C Greene, Greene Machinery Co, Dallas; and R W Nissen, Essley Machinery Co, Chicago.

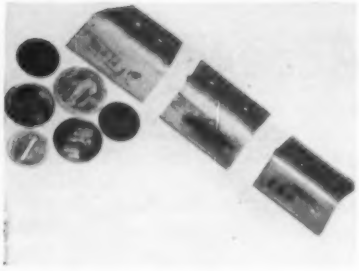
New Heads of AMTDA for 1956-57

PRESIDENT
Joseph F Owens, Jr
General Manager
J F Owens Machinery Co
Syracuse, N Y

FIRST VICE PRESIDENT
Frank H Habicht
VP and General Manager
Marshall & Huschart Machinery Co
Chicago

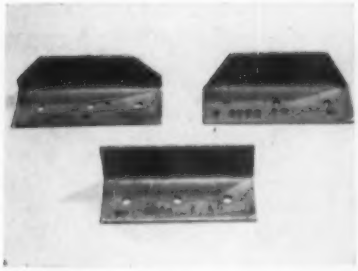
Establish Curtis McGraw Award For Engineering Research

URBANA, ILL—A $1000 Curtis W McGraw Research Award, named in honor of the late President of McGraw-Hill, publishers of American Machinist, will be made annually to the young worker engaged in engineering research at a college or university who is judged to have made the most outstanding "original contribution in engineering research or who has demonstrated high potential for future leadership." The Engineering Research Council will select the recipient and the first award will be made at the American Society for Engineering Education's annual meeting, to be held at Cornell University, June 17 to 21, 1957. Nominations for the award must be in by February 1.



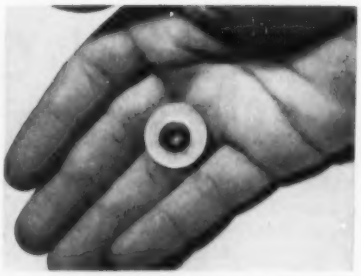
Cost today: 47¢ each
Standardized: 5¢ each

Pierced and formed bracket at left costs Temco 47¢. As a standard part it would cost a nickel. The other two brackets, nearly identical, cost about the same. Two brackets such as that on left are used on a current bomber



Each of these clips is a special part . . .

made from a special drawing, yet the two in background line up perfectly (including the holes). The one in foreground is 1/16 in. shorter but nine times out of ten all three clips could be interchanged



Today's bill: $14.87 for 346
If standardized: $6.92 for 346

These "special" steel washers with a dimpled hole in the center retain insulation in a jet engine compartment. No close tolerances are involved, so the washer could be slightly smaller or larger

Standards Can Cut Plane Prices

DALLAS, TEXAS—At least $25 million a year could be pared off the airframe industry's production costs just by standardizing sheet metal parts. That's what J A Maxwell, Jr, VP manufacturing of Temco Aircraft Corp, Dallas, told the National Industrial Conservation Conference, meeting recently at Phoenix, Ariz.

Temco, he said, in performing major subcontract work for most airframe makers has found that not only is there duplication or near-duplication of such small parts throughout the industry, but within a single company as well. There is good reason for this—a designer can't be expected to know that an item as insignificant as a clip or a bracket, one that would serve his firm's needs adequately, is already in use in his own or another company. But, says Mr Maxwell, if the designer had a sheet metal parts catalog, one in which he could find listed the most commonly used parts, he could frequently select his part without having to design, draw, and write specifications for a new one.

Illustrated above are some prime examples of what Mr Maxwell means. Take the pierced and formed bracket at the left in the photo at top left—it costs 47¢. As a standard bracket it would cost just about a tenth of that. Or take the three clips in the center photo. Not much difference between them. Two of the three line up perfectly, even to the holes. The third is slightly shorter, is scarfed differently, and the holes don't quite line up—but in nine times out of ten, it could be made to do the job of the other two. Yet each of the three is a specially designed part, costing a lot of money to produce. And look at the stamped steel washer in the right photo: it holds insulation in place in an F-101's engine compartment, 346 of them per plane. There's no need for close tolerances here, but the dimpled washers cost $14.87 per plane, because they're made as special parts. Mass produced to standards cost: $6.92.

Save Four Hours per Part

Four hours per part is conservative for the amount of engineering time that could be saved by calling out a standard part. It takes an engineer maybe two hours to design and complete a drawing on a small item like a bracket: then add two hours time for releasing the drawing.

Standardization could apply too to field maintenance of spare parts, Mr Maxwell says. Another aspect: standardization gives the small businessman a chance to turn out these parts by the thousands with a minimum of material, labor, planning, tooling, overhead.

Then there's conservation of material resulting from standardization. Relatively small output of parts is an inefficient way to use material, in production or tooling.

It's a rare case where all sheet metal parts have to be tailor made. And if the aircraft industry uses standardized bolts, screws, nuts, washers and rivets, why not standard parts like these? Even though you'd expect this to be done extensively within a company, Mr Maxwell in looking through his customers' standard books in search of standard clips and brackets found that North American had only 40, Boeing had 21, McDonnell 5—and his own company, Temco, had two!

Well, what can be done about it? First, says Mr Maxwell, a group of engineers, say one from each aircraft company, should select a range of parts most commonly used, or most likely to be needed—in addition to the few now in existence. The engineers could take a certain configuration—then vary its thickness, length and width, much as you find in any standards catalog. What's needed is a nucleus of about 500 parts. Then, by inventorying vendor stockpiles, little-in-demand parts could be dropped from the listing. And other parts could be added on a company's recommendation.

What would standardization of sheet metal aircraft parts mean? Mr Maxwell says it'll result in conservation of: (1) taxpayer dollars by providing more aircraft for the money, (2) engineering manpower, (3) spare parts in field maintenance of aircraft, (4) material, and (5) skilled aircraft workers through expanded use of small business sources.

Numerical Control Gains Acceptance

CINCINNATI — Advantages, disadvantages, applications and problems involved in the use of numerical control for machine tools were emphasized at the eighth annual AIEE Conference on Machine Tools, held here October 22 through 24. Nine of the 12 papers presented, were on this subject: others covered machine tool electrical standards, wiring, and computer elements. In addition to these, panel discussions were held on costs and new developments in static control elements.

Recognition of the current shortage of scientific and engineering manpower was made in opening addresses by Howard K Justice, assistant dean of engineering, University of Cincinnati and Louis K Polk, president of the National Machine Tool Builders' Association. Discussing the problem from the university point of view, dean Justice pointed out that too few capable high school students are going on to college and indicated ways and means by which this condition can be corrected. He outlined approaches that can be taken by both industry and the federal government to shape the careers of high school students and insure graduation of an adequate number of engineering students. Mr Polk, taking the machine tool industry's point of view, described the need for flexible, well rounded, young engineers in the industry.

A panel discussion on new developments in static control elements brought out the varied experiences of manufacturers of this equipment in static switching, use of magnetic amplifiers, silicone rectifiers, transistor applications and ignitron contactors. A spirited discussion on the cost of these devices arose during a question and answer period. Although it was generally recognized that the high cost of machine tool downtime, ($1000 per minute is the estimate of one representative of the automotive industry) made their application well worthwhile. Proximity switches and other devices without moving parts that fail or wear out are eagerly sought by users of high volume production equipment.

In the field of machine tool maintenance, R N Johnson of W F & John Barnes Co described recommended methods of wiring automatic machinery. His paper covered wiring devices, panel layout, costs to the manufacturer and user, and testing and maintenance methods. He pointed out that maintenance of machine controls is one of the principal problems in automated plants, and outlined wiring methods designed to permit quick location of the exact point in a control circuit.

Evaluates NC for Tools

An evaluation of numerical controls for machine tools was presented by Ralph Schuman of Warner & Swasey. A common fallacy noted by Mr Schuman is that a machine with numerical control provides higher production rates than does conventional equipment. The real advantages of numerical control, he pointed out, lie in machining such complex aircraft skins or spars and others such as two and three dimensional cams and turbine buckets. Conventional templet controlled machines, he said, have inaccuracies (in the templet and its mounting) that are not found in numerically controlled equipment. Other advantages gained by NC include the quick setup of tape, compared to templets and accurate first pieces. Disadvantages include complexity of controls, problems in preparing data and psychological factors.

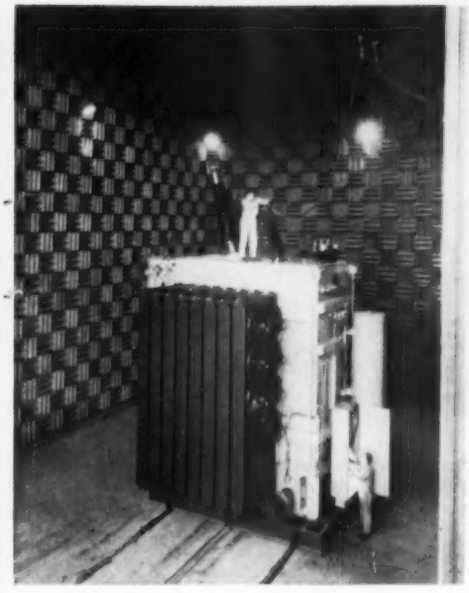
Programming for a large multiaxis tracing machine was described by Kenneth I Jensen, research coordinator for Giddings & Lewis Machine Tool Co. The problems of converting drawings and data into numerical information were covered as well as general programming considerations. In a paper on the availability of computer elements, George F Baldwin, General Electric Co, and H L Tholstrup of Commercial Controls Corp discussed the need for standardization of coded records for the machine tool industry. They also described characteristics of various types of storage media presently available for machine tool control. To achieve any degree of standardization (essential to compatability between data handling systems), designers of machine tool controls, computers, communications equipment, and data processing equipment, must cooperate to the fullest possible extent.

The importance of numerically controlled machine tools in the aircraft industry was outlined by Kenneth G Wood of Boeing Airplane Co. Until recently, he said, automatic manufacturing techniques had been given little attention in this industry because of relatively low volume production. Now, however, the flexibility of numerical control, elimination of human error, faster and easier setup for frequent changes, and other advantages make it entirely practical in aircraft manufacturing.

Operation of a complete system from part print to finished work was described by Jack Rosenberg and Walter Broadwell of Electronic Control Systems Inc. In this system, a methods planner prepares a sheet containing all necessary information from data contained on a conventional blueprint. This information is copied into the input keyboard of a computer, which computes and records the required coordinated pulse trains on magnetic tape. After rewind, the tape is transferred to the machine tool control unit, where a digital servo-drive reproduces exactly the desired coordinated motions. Another application of numerical control was covered in a paper by E E Kirkham of Pratt & Whitney. The machine controlled by this technique is a Pratt & Whitney vertical spindle jig borer with a horizontal table. Mr Kirkham's paper dealt with such elements as tape, tape reader, punch, measuring system, digital-to analog converters, and drive control.

Both the Bendix numerical control system and that used by Cincinnati Milling Machine Co were covered on the final day of the meeting. Robert C Sims of Bendix Aviation Corp described applications of Bendix's system to various types of machine tools and discussed processing, application problems, and field experiences. H M Fuldner of Cincinnati Milling Machine Co outlined Cincinnati numerical control, the combinations of circuits used, and its applications to various machine tools.

Ending the 3-day conference, Tell Berna, executive vice president of the National Machine Tool Builders' Association, was presented with a citation in recognition of his participation in AIEE activities and for his leadership and statesmanship in the machine tool industry.



No noise allowed . . .
in this huge anechoic vault that sound-tests transformers. The vault, as big as a five-story house, holds noise level down to 30 decibels

Everything's under control . . .
by electronic units in this IBM 705 computer, which provides high-speed entry of data into the system, readily accessible storage in the internal memory, and high-speed output of test results. When test starts, instruction program is read into the memory from magnetic tape or punched cards, is stored for use with succeeding information as tests go on

Computer Is Heart of New Transformer Plant

SHARON, PA — It cost Westinghouse's Transformer Division upward of $13 million to enlarge its transformer manufacturing and test facilities, opened here last month. Among the new facilities: a new, 200,000-sq-ft steel-fabricating shop, more than 150,000 sq ft of additions to eight other buildings, expensive purchases of new machine tools and production equipment, and a brand new test center. In all, the expansion will increase transformer production capacity more than 30%.

Most spectacular addition to the Sharon plant is the transformer test center, which can perform complete tests on transformers weighing as little as 5 oz, or as much as 600,000 lb. That means that it can accommodate any unit likely to be built in the next 10 years—ample for assembled units in excess of 500,000 kva.

The center comprises four interrelated parts: a commercial test floor, an anechoic (without echo) vault, a high-voltage development laboratory, and a special room for measuring radio-influence voltages. These are all in the same area. The high-voltage development test floor is used primarily for testing insulation structures. Various high-voltage and RI tests are performed.

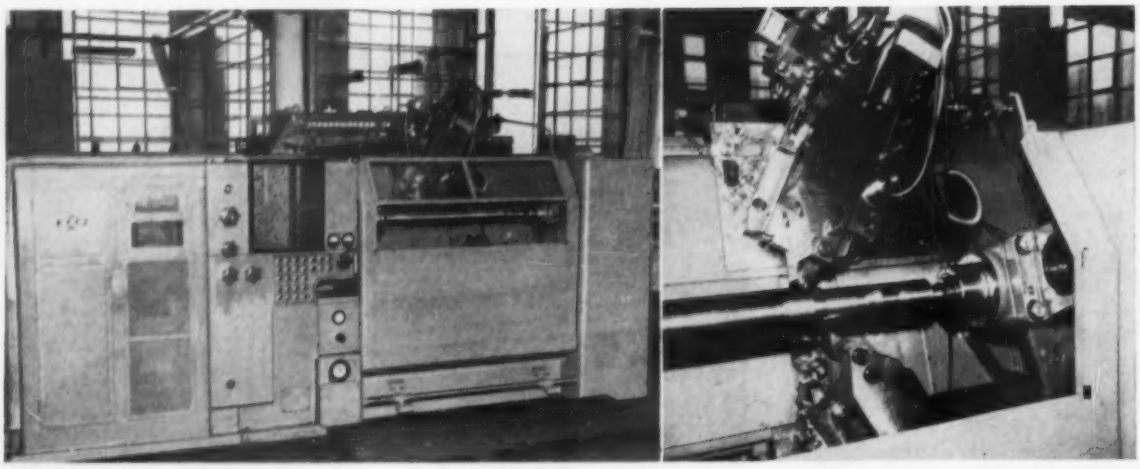
The new Westinghouse test center is primarily a research and development tool, although commercial tests will be conducted, too. The anechoic vault—70 ft long, 56 ft wide, 57 ft high—can make complete sound measurements on transformers rated above 500,000 kva and weighing more than 400 tons. And it allows intensive investigation of methods for cutting down transformer sound and vibration.

Transformer-Designing Computer

An outstanding new development is the IBM 705 electronic data processing machine, made up of 27 separate equipment pieces controlled from an operator's console. The system can be used in designing transformers, controlling inventory, processing manufacturing information, even in making up payrolls.

In transformer design engineering, the unit requires only 3 to 6 min to produce the electrical, mechanical and thermal specifications of a transformer. This once required three days for an engineer to prepare it. In operation, the design requirements of a given transformer are fed into the 705, which then makes arithmetical calculations to arrive at prescribed logical decisions. The result: a design specification less than 5 minutes after the desired characteristics are fed into the machine—including the complete electrical design and much of the mechanical design, printed in detail to be transmitted to the shop for manufacture of the core and coils.

The computer automatically calculates the required proportions of iron, copper and insulation that go into the transformer. It also figures the amount of cooling needed, even down to the number of fans needed if the unit has a forced-air rating. Not only that, the machine turns out a plan view of the tank outline, even defining the location and number of cooling radiators!



Punchcard programming . . .
. . . controls spindle speed on this copying lathe displayed at Czechoslovakia's recent Brno Engineering Exhibition. Master tracer regulates the form. The two tool slides can be used simultaneously for roughing, or rough and fine cuts. Machine has 12 spindle speeds up to 1800 rpm. Center distance is 42 in. (approximately) and swing is 12.5 in. (approximately)

Czechs Bid for No. 4 Spot in

BRNO, CZECHOSLOVAKIA—One hundred new types and models of machine tools, many of them prototypes and pre-production models never before publicly exhibited, took pride of place among some 3000 products of Czechoslovakia's mushrooming industrial expansion, displayed at the annual Brno Engineering Exhibition which closed here October 7. The 100 machines were cited by the Czech government as prime examples of that country's forward thinking, of its growing technology, and of why Czechoslovakia in just a few years has moved into the No. 4 spot as a supplier of the world's machine tools. Among the new Czech machines shown:

● A gear-roller that can hot-forge spur and bevel gears in one-tenth the time needed for conventional hobbing. At the exhibition, the machine (photo at bottom on opposite page) was set up to produce 5.2 in. dia gears in less than 2 min. Blank is first heated by high-frequency induction for 1 min to 1832 F to a depth of 0.315 in. As the gear is formed, its circumference is continuously wire brushed to remove scale and chips. After 8 seconds of rolling, the rotating gear moves to a third station, where the two sides of the teeth are machined, using graphite emulsion as a coolant. Six such machines have been built, although they are still considered experimental because results are not always consistent and some gears were made slightly oversize so that surface material could be removed later. But intensive development work on the machine is going on and the Czechs expect it won't be long before only a finish shaving or grinding will be needed to produce of gears an accuracy comparable to ordinary methods.

The Czechs stress the strength advantages of forging rather than cutting gears, and say they expect to include automatic hardening.

Tracer Lathe

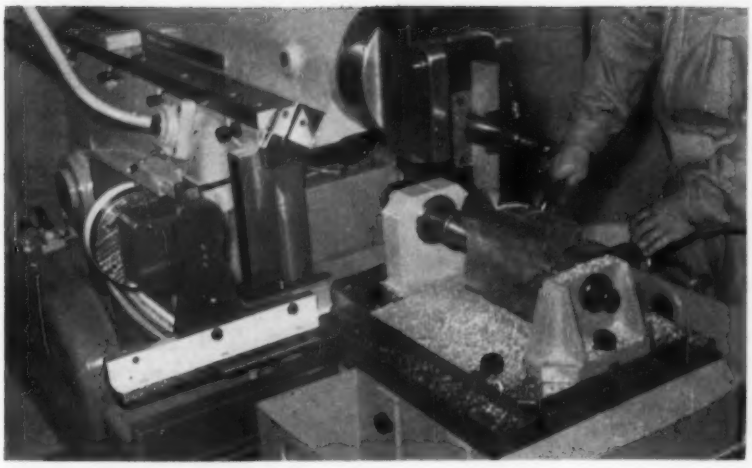
● A copying lathe with punchcard programming of speeds and feeds has an upper and a lower tool slide that can be staggered along the workpiece either for rough cutting or for simultaneous rough and finish turning. A master and hydraulic tracer on top of the machine controls the form, while separate punchcard systems for the two slides determine speeds and feeds.

Changeover and setting-up are said to be very rapid, and operation requires little skill. Other features include an auxiliary horizontal tool bar for grooving, pneumatic chuck, and hydraulic tailstock. Spindle speeds range from 71 to 1800 rpm in 12 steps, and the machine has a 12.4-in. swing and 41.3-in. between centers.

● Largest machine at Brno was a 105-ton horizontal borer with two spindles designed to extend its working range and utilization. The main spindle is 9.8 in. dia with speeds from 2 to 400 rpm, while the 5-in. high-speed spindle above it runs from 6.25 to 1250 rpm. Feeds of the two are independently and infinitely variable, and maximum boring depths are 88.5 in. and 24.8 in. respectively. The headstock has 19.7-in. cross travel and 157.5 in. vertical, while the column moves 196.8 in. on the bed. There are remote measuring gages reading both spindle and headstock travel to an accuracy of 0.0008 in. Unit can do copy milling.

● A novelty on show was a portable slotter intended for temporary attachment to large workpieces or completed assemblies which would be difficult to bring to a conventional machine. Weighing 3 tons, it includes a 97.4-in. supporting slide, drum for the electric power cable, and lifting hook for transport by crane. Stroke of the vertical ram is from 11.8 to 39.4 in., while maximum cross travel of the workhead is 9.8 in. and longitudinal travel 59 in.

● Among the new special-purpose machines was a precision miller for



Electro-hydraulic copy shaper . . .
. . . exhibited at Brno completely machines such complex forms as this blower lobe. Templet and work are turned manually four times through 90° to cover the entire surface. Tracer controls vertical table movement up to 4 in. out of its maximum travel of approximately 14 in.

World Tool Market

cutting narrow slots down to 0.008 in. wide. It was demonstrated milling 1200 slots in a 17.8-in. dia drum for an interlock weaving machine clamped to the rotary dividing table. The 3.15-in. dia cutter is carried on the headstock spindle, which has both horizontal and vertical feed limited by adjustable stops controlling the automatic cycling. After each slot is milled the headstock rapidly traverses clear of the drum, after which the table indexes by the required pitch. Spindle speeds can be varied from 45 to 450 rpm through a 9-speed gearbox, and there are 12 feeds.

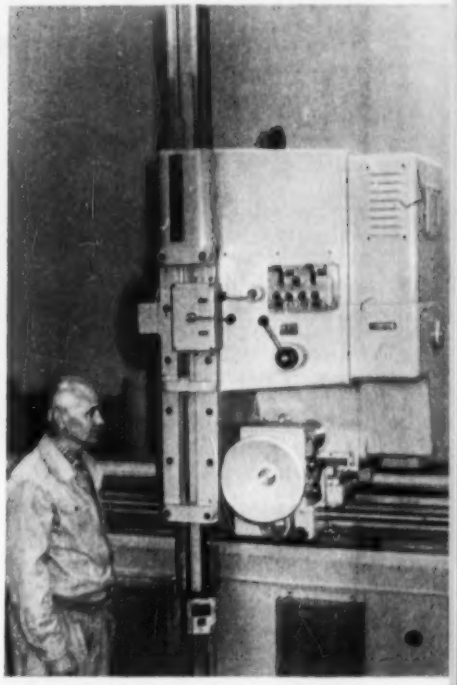
Tracer Shaper

● One of the shapers adapted for copy work is the HO 40 (photo). Control is electro-hydraulic, with the tracer, sensitive to 28 oz-pressure, giving a maximum vertical table movement of 3.9 in. When, as in this case, the entire surface of the workpiece is machined, both the profile template and the work are manually turned four times through 90° to complete the cycle. Hydraulic ram power is 1300 lbs, and maximum stroke is 15.6 in. with 12 to 180 strokes per min.

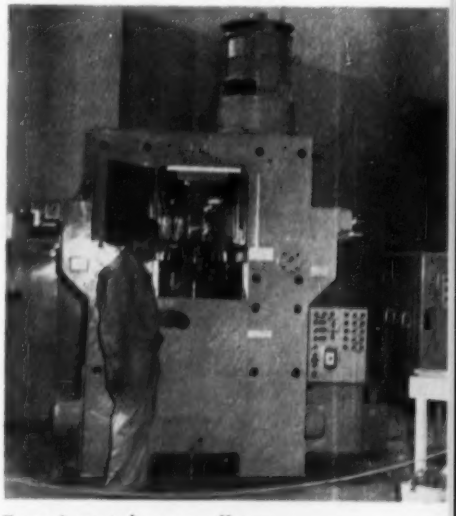
● Another copying attachment was shown on a standard vertical milling machine set up for cutting steam turbine blades from flat blanks. Here the master and work are carried end to end on a longitudinally rotating fixture mounted on the table. The motor-driven fixture turns slightly at the end of each table traverse, while the hydraulic tracer mechanism, responding to 3 lb pressure, controls the vertical position of the table. Both concave and convex surfaces can be machined to a maximum length of 23.6 in.

● A gear-shaving attachment fitted to an ordinary milling machine, intended for small shops, has a scraping wheel driven from the main spindle through a 360° rotatable head, while the gear turns on a simple fixture clamped to the table.

● Ceramic cutting tools were regularly demonstrated both on large cast iron pistons and on steel. Tips were 0.39 in. square by 0.63 in. long, held vertically in a new type of holder that permits the use of all eight edges. The simple holder has curved serrations cut in its outer end engaging the support block, which is attached by a single capscrew and gives a 6° rake angle. The tip is held against the V-groove in the shank merely by a thin retaining wire; there is no top clamp. Tool life was stated to be 30 min for one edge, turning 220 Bhn cast iron pistons at 585 sfpm.



Portable slotter . . .
. . . machines vertical flats on pieces too large to be moved or chucked in a conventional machine. Three-ton unit can be crane-transported, has a base slide for attachment to work. At Brno, machine was demonstrated on this square pedestal



Experimental gear-roller . . .
. . . has automatic cycling for induction heating, tooth forming and rough machining. Cycle time is 1½ to 2 min.—said to be one-tenth the time of ordinary cutting. Machine will handle gears from 2.5 to 10.5 in. dia up to 1.7 in. wide

ASA Urges In-Company Standardization Of Commonly Used Parts

NEW YORK—Citing his own company's simplification of 24,000 varieties of assembly hardware to just 315 items—a 76 to 1 cutback that saves nearly $250,000 a year—R G Munroe of Raytheon Mfg Co's Wayland, Mass, Laboratory, told the American Standards Association's Seventh Annual Conference on Standards held October 22-24, that company standardization is in its infancy. Success or failure of a company standards program, he added, lies almost wholly in the area of human relations.

76-To-1 Item Cutback

His firm's case history of the 76-to-1 reduction in number of items was in the "threaded assembly hardware" category, which usually falls into the "bits and pieces" classification in most companies. The 24,000 varieties resulted from (1) a policy of stocking parts on a project basis over the years, and (2) lack of communication between projects as to what had already been designed and was in stock. A substantial number of engineering changes, Mr Munroe said, were caused by the need to correct hardware callouts on drawings.

The solution: standards engineers prepared a manufacturing specification on "General-purpose assembly hardware," specifying various standard practices to be employed in product assembly. Then the design engineer had merely to look up the appropriate item and specify its location and size on his design layout. Suitable bins were set up on production floors, and standard hardware became an expense item. Saved are store issue paperwork, drafting.

Screw thread standards are everybody's business, Frank P Tisch of Pheoll Mfg Co, Chicago, told the meeting. In line with this, his ASA committee is revising the format of the 1956 American Standard for Unified and American Screw Threads for Screws, Bolts, Nuts and Other Threaded Parts (B1.1-1949)—only the essentials will be included in the body of the standard, supporting material has been transferred to the appendixes. All pertinent text has been brought together in six sections at the front of the standard, with all tabular material relating to standard threads and selected combinations so arranged that all threads of a given diameter appear together in sequence.

The 1956 revised screw thread standards are much the same as those in the 1949 edition, Mr Tisch said. Principal additions have been in the class 3A/3B limits for extra-fine 8, No 12 and 16-thread series, and the inclusion of tolerances in the step tables for special threads of 44 and 27 threads per in. Those for 7 threads per in. have been dropped. Principal changes relate to the minor dia of the internal thread, where the tolerance has been increased to facilitate tapping for sizes ¼ in. and larger, 80 to 4 tpi.

Battelle to Evaluate Metal-Cutting Literature for ASTE

DETROIT—A $37,600 contract has just been awarded to Battelle Memorial Institute for a "thorough and critical evaluation of the present knowledge of metal cutting" by the long-range Metal Cutting Research Project of the American Society of Tool Engineers.

Because 50% of the estimated annual cost of the metal cutting process in the US alone, running to $5 billion, is wasted in the chips machined away, ASTE wants to find out if a better understanding of the process can be developed. This, says ASTE, would result in better machine tools and cutting tool materials, in cheaper methods for machining metals, and ultimately in reduced prices to the consumer of manufactured products.

The study will be the basis for a comprehensive outline of the metal cutting problem, in which the various theories of metal cutting will be assigned to their proper categories. This will serve to determine the areas in which further research is needed. And it is hoped that the study may uncover never-before variables in the science of metal cutting.

Dr James C Hodge, vice president of Warner & Swasey Co, has been elected executive vice president and a director

Stanley J Roush has been elected group vice president of Borg-Warner Corp. He will retain his present posts as president of the Atkins Saw Division of B-W, and president of Morse Chain Co, a B-W subsidiary. **Robert O Bass** has been named executive vice president and assistant general manager of Morse Chain. He will continue to serve as president of the Eberhardt-Denver Co, Denver, Colo, company acquired by Morse Chain in February.

Anthony J Snyder has been named assistant to the vice president, sales, of Firth Sterling, Inc, Pittsburgh. Prior to the appointment he served as sales manager of Motch & Merryweather Machinery Co's Cutting Tool Division.

Theodore J Englund has been appointed manager of industrial engineering, Norton Co, and **Paul L Lantz** has been named assistant manager. **William F Watts** has been named factory manager of the Refractories Division; **William P Densmore** has been appointed chief industrial engineer in the division.

G A Gilbertson, executive vice president and general manager of the Frank G Hough Co, Libertyville, Ill, subsidiary of International Harvester Co, has been elected president and chief operating officer. He succeeds **Frank G Hough,** founder and president, named chairman of the board.

Sam Gurley, Jr, has been elected vice president, sales, for H K Porter Co. He was formerly associated with Reichhold Chemicals in a similar capacity.

William H Mann, assistant to the sales manager of Skinner Chuck Co's Electric Valve Division, has been promoted to sales manager.

Richard W Banfield (see below)

Philip O Geier, Jr, (left) has been appointed to the new post of assistant manager of the Cincinnati Milling Products Division of Cincinnati Milling & Grinding Machines, Inc. **Harold W Cottrell** succeeds Mr Geier as sales manager

Names in the News . . .

Richard W Banfield has been elected president and chief executive officer of Motch & Merryweather Machinery Co, Cleveland, effective Dec 1. He will succeed **Charles B Lansing** who will remain as a consultant and member of the board of directors. A Dartmouth graduate, Mr Banfield joined Niles-Bement-Pond Co in 1935 as a special apprentice and rose through many positions to executive vice president and director in 1954. Motch & Merryweather is the largest distributor of machine tools in the United States and also makes machine tools and cutting tools.

H R Leber has been appointed a vice president of Sundstrand Michigan Corp, a subsidiary of Sundstrand Machine Tool Co. He will continue to serve as general sales manager of Sundstrand's Machine Tool Division.

Richard E Krafve, general manager of the Special Products Division of Ford Motor Co, has been elected a vice president of the company.

J J Punke, senior vice president in charge of engineering and manufacturing at Precision Castings Co, has been appointed executive vice president.

Albert A Arbogast has been named to succeed **Raymond A St John** (see below) as Detroit branch manager of The Heald Machine Co, Worcester, Mass. He was formerly manager of the Indianapolis office. **Gerald P Robert,** sales engineer in the Detroit area, has been appointed assistant manager at Detroit.

Edward E Helm, vice president and general manager of Reliance Electric & Engineering Co, Cleveland, has been elected president to succeed **James W Corey,** made chairman of the board.

Thomas E Rounds has been appointed vice president of the Barden Corp, Danbury, Conn. **Bruce L Mims,** assistant chief engineer, takes over Mr Rounds' former duties as chief engineer.

Walter R Bush has joined Fenwal Inc, Ashland, Mass, as vice president, engineering. He was previously chief components development engineer for Republic Aviation Corp.

Charles M Hawkins, plant manager of Ehrhardt Tool & Machine Co, St Louis, Mo, has been appointed general manager.

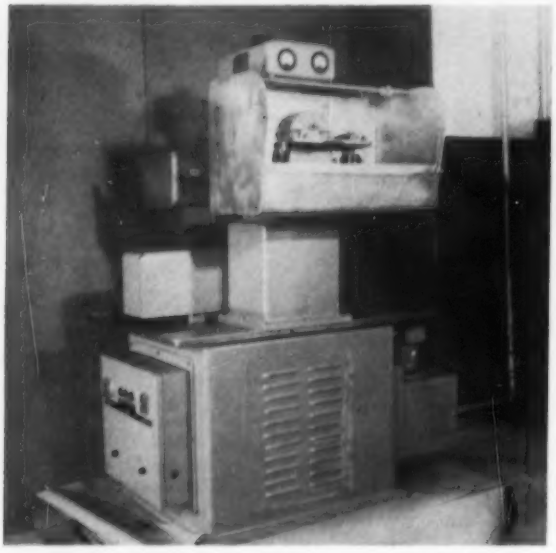
OBITUARY

J F Costigan, works manager of Allis-Chalmers Norwood (Ohio) Works, has been named assistant director of manufacturing of the company's Industries Group

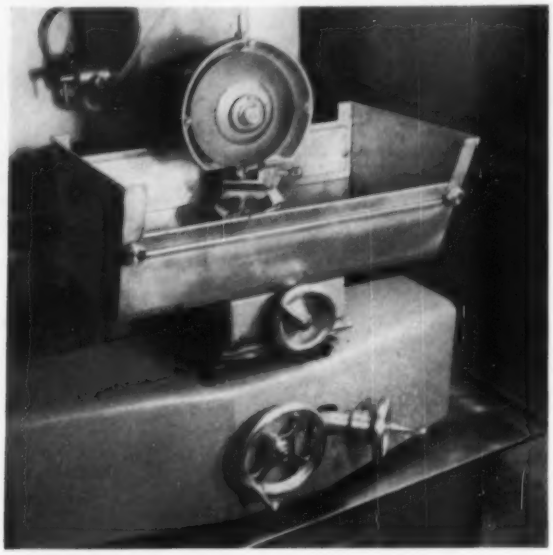
Raymond A St John has been appointed general sales manager of The Heald Machine Co, Worcester, Mass. He was formerly manager of the company's Detroit branch sales office. (Additional appointments listed above)

Douglas T Hamilton, 71, who retired in 1952 after 35 years as publicity manager for The Fellows Gear Shaper Co, Springfield, Vt, died in Danbury, Conn, Sept 26

New Shop Equipment



DIRECT-CURRENT POWER SOURCE *is provided as an integral part of machine. View is of offhand side; double-end spindle allows chipbreaker grinding on other side of machine*



CHIPBREAKER SIDE OF MACHINE *in closeup shows stainless rocker-type universal vise which serves as workholding fixture. Angular control in three dimensions is provided*

Everite Electrolytic Grinder Sharpens and Shapes Carbide Tools

Sharpening and shaping of carbide tools by electrochemical dissolution can be accomplished on the Electrochemical Machine Tool H-1, which is specifically designed for this process. Package unit is designed to handle corrosive electrolytes and is capable of performing electrolysis without the aid of a separate piece of equipment to provide direct current; dc power source is an integral part of the machine tool.

Process on which unit works is based on anodic dissolution. Tool or part to be shaped is made anodic, and a rotating cathode is mounted on the spindle, which has been insulated from the machine body. In place of the usual coolant an electrolyte is fed to the center of the rotating cathode and is distributed over its face by centrifugal action. Nature of the electrolyte is such as to cause metal to dissolve from the anodic workpiece but to prevent deposition of the dissolved metal upon the cathode.

For most applications a metal-bonded diamond wheel is reported suitable as a cathode. Anodic workpiece is held in contact with the rotating wheel with just sufficient pressure to maintain contact. Anode-cathode interface has a gap distance of very small magnitude, and currents of very high density are obtained at low voltages. Primary function of diamonds in wheel is to wipe away insoluble anode-reaction products from work, thus insuring controlled metal removal.

Because the removal of carbide is substantially electrochemical and not mechanical in nature, wheel wear is held to a low level. Only one wheel reportedly is required to provide finish of 5 to 8 mu-in. rms, regardless of the roughness of the carbide surface to be treated. Work remains at ambient temperature at all times, heat cracks do not occur, and dangers of thermal shock and stress raisers in the form of fine abrasive scratches are virtually nil.

Machine is provided with a double-ended spindle, so that both offhand and chipbreaker grinding can be performed. To facilitate mounting of the cathode wheel on the offhand side of the spindle to less than 0.0005-in. total indicator runout, a special ball-and-setscrew device is incorporated in the back-up plate; running truth as low as 0.0002-in. total indicator runout can be obtained with this device.

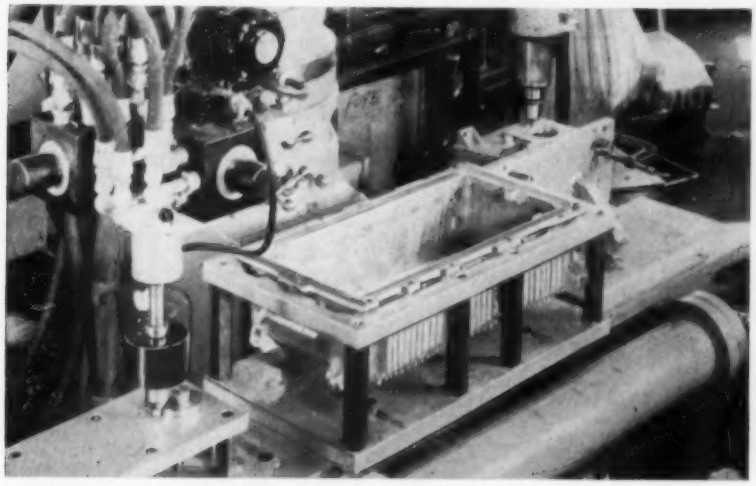
Electrolyte used is an aqueous solution and is consequently corrosive. To overcome this problem, machine parts exposed to solution are of corrosion-resistant materials or are finished with organic materials resistant to acid and akaline spray.

Everite Machine Products Co, 2005 E Huntingdon St, Philadelphia 25, Penna

Plastic tubing, available in eleven standard sizes to 1-in. ID, is offered in both transparent vinyl and translucent polyethylene forms. Tubing will handle a wide variety of chemicals and reagents, has excellent flexibility and non-toxicity.

American Agile Corp, 5461 Dunham Rd, Maple Heights, Ohio

Materials and Parts . . .



Turchan Tracer Control System Reproduces Contours Automatically

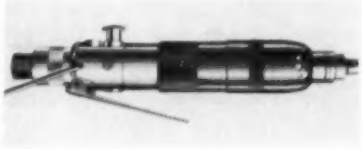
Adaptable to any standard milling machine, hydro-magnetic tracer control system incorporates a magnetic sensing stylus by which a closed two-dimensional or 360° contour is reproduced automatically. No control action is required by operator other than predetermining maximum feed rates. Unit features an adjustable tracer and a feed-speed range that will remain constant along any 360° contour during tracing operations.

Tracer control movements to saddle and table are through hydraulic cylinders. Tracer valve is mounted in a vertical plane in direct relation to and parallel with the axis of the vertical spindle; it is equipped with a built-in selector that enables the operator to use the valve as an automatic 360° pencil tracer control. With this feature, operator can use an oversized tracer stylus under hand control to machine pockets of a predetermined depth, then finish out the pocket periphery by utilizing the automatic 360° control feature.

Tracer is mounted on a swivel overarm which provides a wide range of settings between tracer and vertical spindle, so that the largest of workpieces can be machined, within conventional travel limits of mill.

Illustration shows magnesium casting being machined. Four intricately contoured sides and one end of casting are finish-machined and the top surface is grooved.

Turchan Follower Machine Co, 8259 Livernois Ave, Detroit 4, Mich



Air-Powered Screwdriver Features Quiet Exhaust

Dulcetone runs with quiet, gentle exhaust controlled by new system that adds neither extra weight nor bulk, yet permits running at full rated speed and power.

Models 7500-B and 7501-B can be reversed instantly in operation, by pushbutton, without need of releasing lever throttle. Adjustable-clutch models can be preset to correct torque requirements. Tool can be easily converted to nutsetter. Units have nominal capacity of No. 8 free running nuts and machine screws. Speed is 1800 rpm.

Aro Equipment Corp, Bryan, Ohio

. . . including

MACHINE TOOLS AND ATTACHMENTS

Metal-Sawing Machine 184
Horizontal Boring Mill 186
Cylindrical Grinder 188
Transfer Grinding Machine 194
Radial Drills 196
Lapping Machine 198

TOOLS AND ACCESSORIES

Chromium-Coated Files 184
Portable Marking Machine 186
Boring-Bar Cartridge 188
Floating Toolholder 194
Dresser Cutters 206

FORMING

High-Speed Press 184
Punchpress 188
Press Control 192

WELDING AND HEAT-TREATING

Manual Welding Process 184
Welding Torch 198
Temperature Controllers 218

CLEANING AND FINISHING

Burr-Finishing Machine 186
Emulsion Cleaning Fluid 222

INSPECTION AND LAYOUT

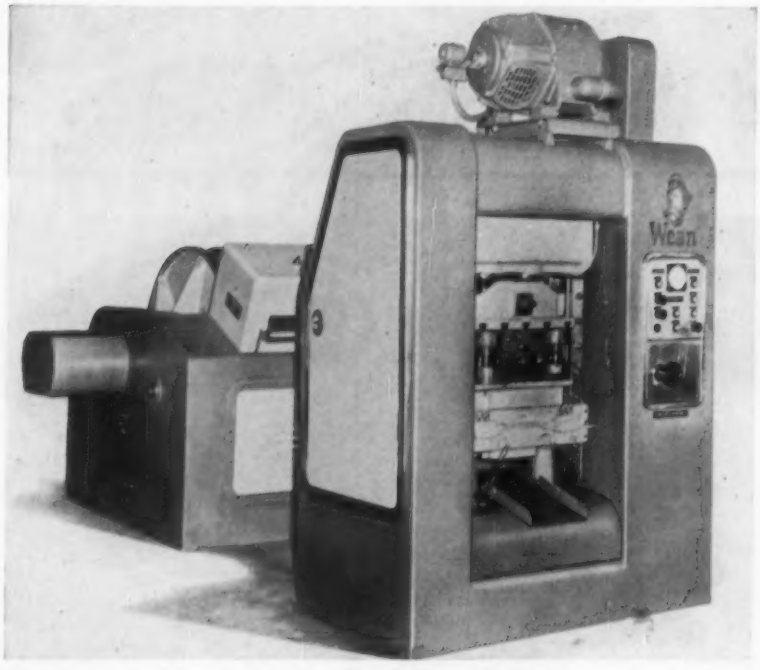
Thickness Gage 186
Precision Layout Machine 190

PLANT SERVICE EQUIPMENT

Platen Conveyors 192
Portable Stacking Rack 198
Nylon Webbing Sling 206

PARTS AND MATERIALS

Automatic Speed Control 192
Plastic Pipe 216
O-Ring Tube Fittings 223



Stock and Platen Movements Are Sychronized on Wean Press

The Wean "Flying Press" incorporates movable upper and lower platens which synchronize with the forward motion of strip stock during the time in which work is performed. A set of feed rolls is geared into the motion of the dies, so that the stock is fed continuously rather than on a start-stop basis, thus permitting high strip speeds. Length of index is infinitely adjustable on the press.

Press upper die is in motion relative to the stock strip, moving in a perfect circle equal in diameter to the throw of cams on a camshaft driven by bull gears. As a result, upper die has a maximum forward-speed component and the strike is made at the bottom of this circular movement. The lower die, held in place by a pin, meanwhile moves in a flat arc, the result of its being fastened to reciprocating slides which confine it to rotary motion. In relation to each other, the upper and lower dies move up and down, so that conventional diesets with engaging guide posts can be used.

Stock strip, fed continuously from rolls, goes through the die at its own rate of speed until the die hits; then the rolls release the strip, which moves at the maximum forward speed of the die. Because the die pulls the strip, speed variations during the strike are compensated for. Synchronization is based on the die's maximum forward speed and a variable-speed gear drive taken from the camshaft for the feed. Unlike conventional setups, where the work is stationary, the stamped part moves in a parabolic arc relative to the floor.

High-speed feed of material is said to constitute an important difference between unit and other so-called flying presses. Designed to run at 600 spm with a 9-in. index or length of feed, press moves stock through at a rate of 5400 ipm. Unit is reported approximately to triple ordinary rates obtained in making laminations, gaskets, cups, and similar parts, and to obtain equal results in such operations as lancing and progressive die work. Shallow-drawn parts can also be made easily, but deep draws are not usually applicable because of the speed of operation.

Press has neither clutch nor brake, thereby reducing maintenance problems. Bearings are lubricated by a pressurized oil system. A specially designed decoiler is provided for use with the unit, which has a control panel arranged for manual or automatic operation.

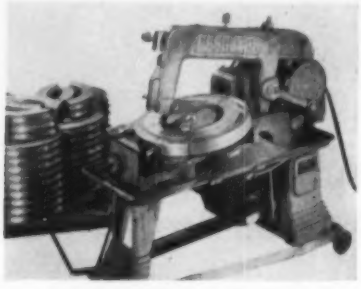
Wean Equipment Co, 22828 Lakeland Blvd, Cleveland 17, Ohio

New Manual Welding Process To Be Introduced by Linde

Process to be called Unionarc is an open-arc welding process utilizing a continuously fed bare wire. Significance of process, which will be featured at American Welding Society Show in Philadelphia in April, 1957, is that it is a non-critical process for the manual welding of all types of carbon steel.

Welds can be made with semi-automatic precision in all positions. Operator can go from flat to vertical to overhead without changing welding conditions or equipment. It is not sensitive to such things as rusty plate, poor fitup, and similar factors.

Linde Air Products Co, Div of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, NY



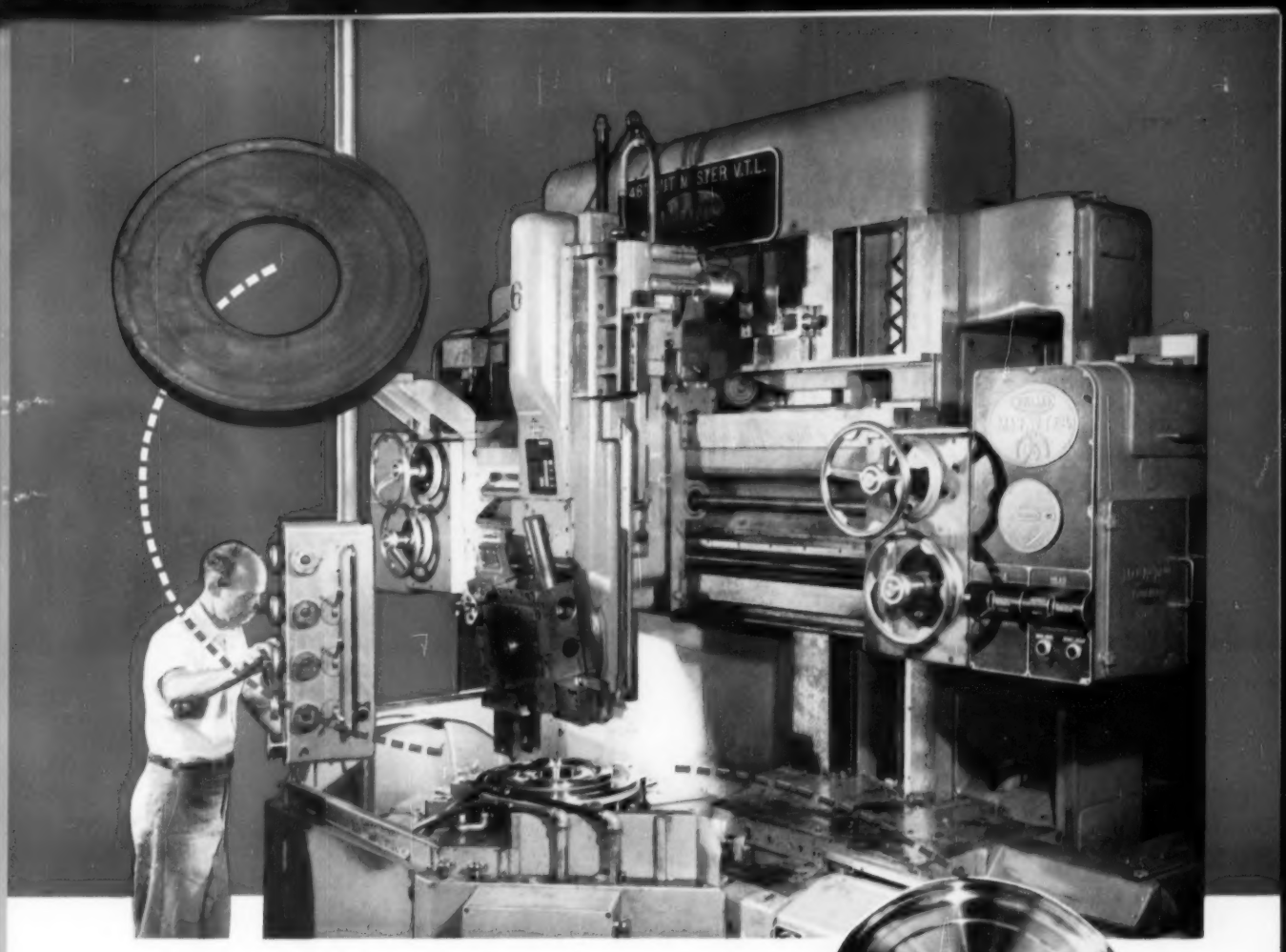
MILLING-MACHINE LOCKNUTS are machined on Speed-Cut metal-sawing machine. Four cuts are made in each ring. Special revolving fixture mounted in a cross-slide is arranged so that sawing can be done at any angle and in any position—*Peerless Machine Co, 1600 Junction Ave, Racine, Wis*

Chromium Coating Adds to Life of Tiarco Files

Kromolloy is designation for line of files made of steel hard-surfaced with chromium. Reportedly non-clogging and rust-resistant, tools are given a special preliminary treatment which removes surface oxidation, thus making possible good bonding properties between chromium and the base metal. Company guarantees at least 100% longer life for Kromolloy files than for the same files unprocessed.

Tools are said to have a Rockwell hardness of C-70 or better. Process can be applied to other tools, such as drills, countersinks, and saw blades. Files are offered in complete line of Swiss and American patterns.

Tiarco Corp, Clark, NJ



"To produce quality parts in quantity . . .

Nothing beats Man·Au·Trol"

This statement by Mr. W. Mason Williams, Manufacturing Manager of the Jet Division, Thompson Products Inc., Cleveland, Ohio, is based on ten years of experience with Man-Au-Trol.

"If it hadn't been for Man-Au-Trol" Mr. Williams continues, "we would still be turning out aircraft engine components on manually-operated machines. Man-Au-Trol, particularly when tooled with better cutting tools, has enabled us to turn out at least *five times as many compressor disc and turbine discs per shift* as we produced on hand-operated equipment."

BULLARD

You, too, can apply to your machining problems the many advantages offered by Man-Au-Trol, Model 75 — just call your nearest Bullard Sales Office, Distributor or write for catalog to

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

Steel gussets, ⅜-in. thick are sigma welded to ¾-in. thick drum ends at an average speed of 15-in. per minute.

This welding operator doesn't have to bother with fluxes—and he doesn't lose valuable time changing burned down electrodes. In fact, by using sigma welding in this operation, the Cardwell Manufacturing Company, Wichita, Kansas has increased welding speed and almost doubled arc time. The results—a better product, faster, and at less cost.

AUTOMATIC WIRE FEED

Sigma welding uses a welding wire, supplied from a convenient sized coil, as a consumable electrode. In this case it is stainless steel wire which is fed automatically, and at a predetermined rate, into the welding arc. This ups welding speeds and simplifies work.

NO FLUX

The arc is maintained in a shield of argon gas which envelopes the area between welding wire and work piece. Inert gas protection assures highest weld quality, and further simplifies welding operations.

Sigma welding is available in both manual and mechanized setups. Call or write your local LINDE representative for free illustrated literature, and find out how you can gain new production speed and unit quality with a sigma welding installation.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Linde
Trade-Mark

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 4-IN. CONCENTRIC GRINDER—*Landis Tool Co, Waynesboro, Penna.* 4-page illustrated catalog CX-56 describes shoe-type centerless grinding method for ring-shaped parts with either straight or profiled shapes. Construction features, specifications, standard and optional equipment covered.

2 AIR POWER NOTCHING & PUNCHING MACHINE—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 4, NY.* Bulletin 79-D gives details on Model 55-5. Illustrations show variety of uses for punching, notching, shearing, slitting, and bending. Data also included on Model 5-24 hand lever punch and shear.

3 TOGGLE HEADERS — *Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 8-page circular 854-A-4 contains illustrated information on machines for upsetting heads on screw and rivet blanks and forming tubular rivet blanks. Toggle headers have production speeds of 100 to 150 blanks per minute; tubular rivet headers, 100 per min. Operational data, special equipment, specifications, table of standard tool dimensions for three machine sizes included.

4 MILLING SPINDLES — *Standard Electrical Tool Co, 2488-98 River Rd, Cincinnati 4, Ohio.* 6-page bulletin C15 gives detailed data on super precision spindles for milling, boring, routing, drilling. Covers motorized units in sizes up to 200 hp, independent drive models in sizes up to 60 hp.

5 AUTOMATIC TOOLING FOR STANDARD ASSEMBLY MACHINES—*Ferguson Machine Corp, Hicks Development Div, PO Box 850, Lebanon, Ind.* 4-page bulletin 500 illustrates and describes applications of standard "Intermittor" rotary and "Trans-O-Mator" in-line automatic assembly machine bases. Versatility of bases discussed, as well as company's usage of standardized tooling.

6 SPECIAL FIXTURES — *Pratt & Whitney Co, Charter Oak Blvd, West Hartford 1, Conn.* Circular 590-A illustrates and describes units for mounting on Veivetrace milling machine to facilitate setup and machining of linear or circular work. Duplex rotary fixture, right and left fixture, depth templet attachment, and adjustable model fixture discussed.

7 CIRCULAR SAWING MACHINE—*Motch & Merrywcather Machinery Co, Penton Bldg, Cleveland 13, Ohio.* 4-page bulletin pictures and provides data on No. 90 Series for ferrous and non-ferrous metals; processes smaller stock, up to 1¼ in. dia. Triple-Chip Method, and other advantages described; specifications included.

• MULTIPLE-HEAD ABRASIVE BELT GRINDERS—*Engelberg Huller Co, 821 W Fayette St, Syracuse 4, NY.* 4-page bulletin gives details on one, two, four, and five-head models designed for high-volume flat surfacing of ferrous and non-ferrous metals and other materials. Conveyor-type units permit a single-cycle operation from rough grind to final polish. Specifications, data on abrasive belts, tolerances, and production rates included. Request direct on company letterhead.

8 TURRET DRILLING MACHINE—*Howe & Fant, 80 Fitch St, East Norwalk, Conn.* 20-page illustrated brochure, "New Dollars for You," covers such points as initial cost, power and maintenance cost, floor space savings, setup, handling, and downtime, plus breakdown on annual savings.

TOOLS AND ACCESSORIES

9 PRESS BRAKE DIE MANUAL—*Cyril Bath Co, 23885 Aurora Rd, Solon, Ohio.* 48-page wirebound booklet, Form D-955, illustrates and describes dies in most common use, grouped primarily by type of bend involved. Supplementary information included on sheet, strip, and plate gages and weights.

10 CRANKSHAFT GRINDING WHEELS—*Simonds Abrasive Co, Tacony & Fraley Sts, Philadelphia 37, Penna.* 4-page illustrated bulletin ESA-262 includes special information for multiple spindle setups for grinding main or line bearings, and single wheel setups for pin bearings. Regrinding automotive crankshafts, and production grinding wheel specifications for camshaft grinding covered.

11 MECHANICAL COMPARATOR — *Pratt & Whitney Co, Charter Oak Blvd, West Hartford 1, Conn.* 8-page circular pictures and describes the Sigmatic

Name .....
Title .....
Company .....
Co. Address .....
.....
AMERICAN MACHINIST. 11-5-56 Not good after Jan. 5, 1957

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

(duplicate of the above coupon)
(duplicate of the above coupon)
(duplicate of the above coupon)
(duplicate of the above coupon)
(duplicate of the above coupon)
(duplicate of the above coupon)

FYI
FOR YOUR INFORMATION

for close tolerance inspection. Construction details, operation, Sigmatic gaging principle detailed. Instrument has choice of 6 scales with magnifications from 300 to 5000X.

12 POWER LUBRICATION SYSTEMS —*Lincoln Engineering Co, 5703-27 Natural Bridge Ave, St Louis 20, Mo.* Catalog 811 gives details on power-operated, centralized systems. Contains description and functions of manual as well as mechanical and electric automatic controls; various types of installations pictured.

13 SWIVEL MACHINE VISES—*Chicago Tool & Engineering Co, 8333 S Chicago Ave, Chicago 17, Ill.* Illustrated literature contains description of Palmgren No. 40B—4-in. and 60B—6-in. heavy-duty units for use with or without swivel bases.

14 ROTARY KNIVES—*Cowles Tool Co, 2086 W 110th St, Cleveland 2, Ohio.* 4-page bulletin 561 pictures and describes slitting, trimming, and special slitting knives; spacers; scrap chopper blades; metal lathe tools; tube mill and special tools.

15 COLLOIDAL DISPERSIONS—*Acheson Colloids Co, Port Huron, Mich.* 4-page folder describes variety of applications for 'dag' dispersions in current use in variety of industries.

16 PNEUMATIC PROCESS CONTROL INSTRUMENTS—*US Gage, Division of American Machine & Metals, Inc, Sellersville, Penna.* 16-page catalog 505 covers indicating pilots, transmitters, and receiver gages. Complete data included on measuring elements for pressure and temperature applications.

HEAT TREATING AND WELDING

17 WELDING ROD COMPARISON CHART—*Page Steel & Wire Div, American Chain & Cable Co, Monessen, Penna.* Bulletin DH-1218-J details physical properties as welded, gives analysis, tensile strength, elongation, average Rockwell hardness, and lists typical uses of gas welding rods, bare electrodes, automatic welding wire and metal spray wire.

18 INFRARED ANALYZERS FOR MONITORING FURNACE ATMOSPHERES—*Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Penna.* 8-page illustrated folder N-91-620(1) discusses application of equipment to monitor CO, CO_2, or CH_4 content of metallurgical atmospheres. Typical chart records illustrated, as well as schematic diagrams of applications and description of equipment.

PLANT SERVICE EQUIPMENT

19 ANNUNCIATOR SYSTEMS—*Panalarm Div, Panellit, Inc, 7401 N Hamlin Ave, Skokie, Ill.* 32-page catalog 100B describes complete line of standard, integrated systems. Function and general features discussed; typical industrial applications illustrated; operating sequences, mechanical specifications; technical data and performance details included.

20 TRUCKS & STORAGE RACKS — *Lewis-Shepard Products, Dept R-33, Watertown, Mass.* 20-page illustrated catalog 29-1 covers Floormaster trucks and Loadmaster racks; includes specifications and applications for complete line.

21 STATIC SWITCHING SYSTEMS—*General Electric Co, Schenectady 5, NY.* 8-page illustrated bulletin GEA-6364 describes operation of a system and lists advantages such as reduced downtime, reduced inspection and replacement, and minimized atmospheric problems.

22 DETERGENT AND RUST PREVENTIVE—*Harry Miller Corp, 4th & Bristol Sts, Philadelphia 40, Penna.* 12-page booklet describes properties and advantages of Immunol, a non-alkaline, non-acid, non-flammable product that cleans, degreases, and rustproofs metal in one operation. Applications illustrated.

23 HYDRAULIC-MAGNETIC CIRCUIT BREAKERS — *Heinemann Electric Co, 230 Plum St, Trenton 2, NJ.* 20-page illustrated bulletin 3411 contains detailed description of principle, design, operation, and application of general purpose breaker.

24 LEVELING JACKS—*Enterprise Machine Parts Corp, 2731 Jerome at McNichols Rd, Detroit 12, Mich.* 4-page bulletin presents illustrated information on available Empco models, sizes, and capacities, and data on reducing vibration in machine tool setups.

25 "ENGINEERED HYDRAULIC EQUIPMENT"—*Century Hydraulics, Inc, 7703 Lyndon Ave, Detroit 38, Mich.* Catalog contains detailed engineering information on hydraulic reservoirs and hydraulic pumping unit accessories with dimensional data sheets. Information included on oil level sight gages, breather caps, filter breather assemblies, and clarifier units.

PARTS AND MATERIALS

26 PRECISION BALL BEARINGS — *Barden Corp, Danbury, Conn.* 64-page catalog contains dimensional index, a series index, a visual guide to types, characteristics, and applications, as well as separate index to selection and engineering data. Includes dimensions, descriptions, specifications; complete torque, static and dynamic data in chart and tabular form.

27 CONTROL VALVES — *Conoflow Corp, 2100 Arch St, Philadelphia 3, Penna.* Illustrated 12-page bulletin LB-2 gives details on construction and operating characteristics of Series LB available in sizes 1 through 4 in. Includes specifications and valve sizing data.

28 SELF-LOCKING SOCKET SCREWS —*Standard Pressed Steel Co, Box 875, Jenkintown, Penna.* 16-page booklet pictures and describes Unbrako screws with Nylok self-locking insert. Sizes, dimensions, threads per inch; technical data on material, temperature range of application, resistance to fluids, durability and plastic memory included.

29 SHEAVES — *Allis-Chalmers Manufacturing Co, 999 S 70th St, Milwaukee, Wis.* 4-page bulletin 20B8524 contains illustrated description of one and two-groove Magi-Key sheaves for quick speed adjustment of Texrope V-belt drives in A and B sections. Construction features, hp capacity, and dimension tables provided.

30 FASTENINGS—*H M Harper Co, Morton Grove, Ill.* 24-page illustrated Flo-Form brochure (Form No. 613) describes corrosion-resistant fastenings.

31 UNIVERSAL JOINTS—*Detroit Bevel Gear Co, 8130 Joz Campau, Detroit 11, Mich.* 8-page catalog contains cutaway drawings, engineering dimensions, and specifications for each of the joints in company's line. Performance characteristics and applications included.

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

How to cut costs with

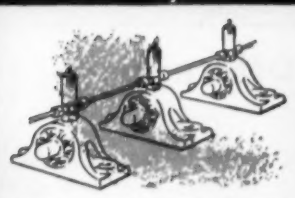
ALEMITE

Accumatic

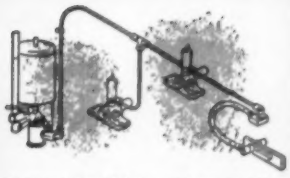
CENTRALIZED AUTOMATIC LUBRICATION

Can be built into any machine, in 4 easy steps

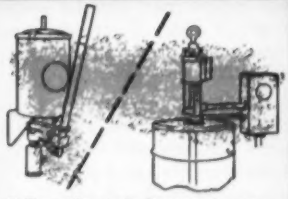
1. Replace grease cups or grease fittings with Accumatic fittings. (Available in same thread sizes as grease fittings, cups.)



2. Connect Accumatic fittings with copper tubing. (Alemite has tubing, clips and accessories for fast, neat installation.)



3. Connect sliding, rotary or oscillating parts into tubing system. (Flexible hose and swivels available for moving parts.)



4. Provide central pump to supply lubricant to system. (May be ordinary hand pump or fully automatic barrel pump.)

Type 1 Accumatic Valves

For fluid oil or light grease. In range of sizes, delivering from .005 to .100 cu. in. of lubricant. Various shapes: Tees, straight-thru, inserts, angles. Spring pressure provides gradual feed. Adjustable or fixed output. System serves up to 400 bearings. Manual or automatic operation available.

Factory-tested—field-proved!

Exhaustive in-the-field tests show no appreciable variation in the amount of lubricant discharged after 73,312 lubrication cycles—equal to 122 *years of twice-a-day service!*

Offers All These Advantages!

- Prevents application of wrong lubricant.
- Seals completely against dirt, grit, water.
- No parts are neglected—lubricates inaccessible and dangerous bearings.
- Eliminates product spoilage due to over-lubrication.
- Eliminates point-by-point lubrication methods—services all bearings in one operation.
- Delivers *exact* amount of lubricant to bearing.

ALEMITE

REG. U. S. PAT. OFF.

A Product of STEWART-WARNER CORPORATION

STEWART SW WARNER

FREE!

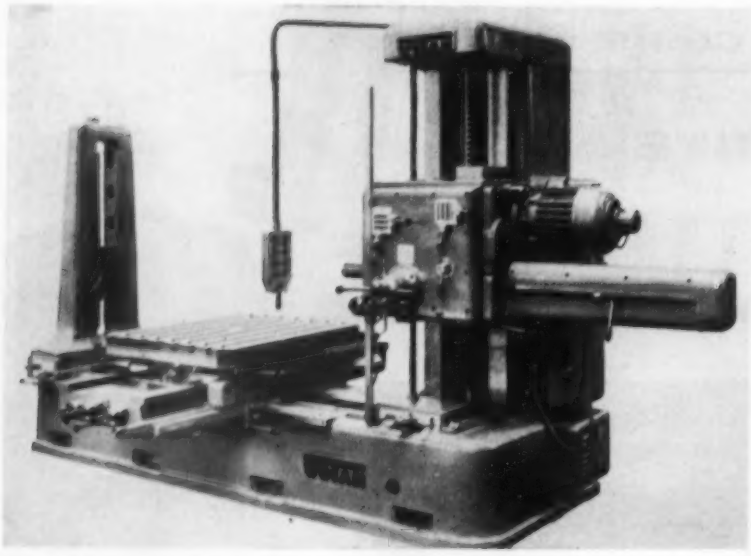
Alemite, Dept. C-116
1850 Diversey Parkway, Chicago 14, Illinois

Please send me my free copy of the Alemite Accumatic Catalog.

Name .....

Company .....

City ..... State .....



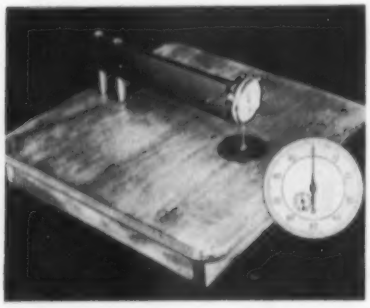
Horizontal Boring Mill Offered In Redesigned Version

Wotan No. B85 3⅜-in. horizontal boring, milling, and drilling machine is of a new design throughout. German-made unit is provided with optical reading attachments for positioning of spindle head, outboard support and cross table; rapid engagement of all speeds; and sturdy driving elements.

Special design feature incorporates the spindle sleeve bearings directly in the spindle-head housing, making for greater rigidity and accuracy. Facing operations are performed on this machine with a facing head that can be mounted on the spindle sleeve. Selection of 21 spindle speeds (9 to 1000 rpm) and of the 27 feed rates (0.0012 to 0.50 ipr) is obtained from two groups of 3 levers each. Feed gear box is so arranged that thread leads are obtained without any need for additional special equipment.

Power-operated rotary table is standard equipment. Table-top swivel motion can also be operated manually with a crank handle. Special feature enables operator to position not only the spindle, but also the spindle head, table, and bed carriage by means of the capstan on the spindle head, and to read movements on dial.

Imported by Parker Machine Co, Inc, 158 Pioneer St, Brooklyn 31, NY



Evatype Thickness Gage Measures Work as Thick as 10 in.

Device called Eva-guage is a thickness gage which provides readings to nearest 0.001 in. Dial indicator is mounted on a steel arm anchored to a steel foundation on the underside of the 18 x 18-in. hard maple table.

In operation, dial indicator operates against a 3-in. round steel anvil on the table and furnishes a reading gage by thousandths from zero to 1 in. Throat capacity is 10 in.

Evatype Corp, PO Box 232, Deerfield, Ill

Battery for electric industrial trucks, called the Super Dreadnaught, is available in every motive-power capacity: the 40 amp-hr positive plate for standard-height batteries; the 60 for high-type; and the 120 for extra-high batteries.

Gould-National Batteries, Inc, Trenton 7, N J

Machined Parts Are Deburred On Indexing Finisher

Continuous deburring of finish-machined cast iron or non-ferrous parts at rates ranging from 250 to 350 per hr can be attained with Burr-Blaster. Machine is designed for removal of all burrs not caused by upsetting of metal. Ground-up walnut shells and peach pits, silicon carbide, aluminum oxide, steel shot, and grit can all be used in the in-line indexing machine.

Parts enter at front of machine and either roll or slide down a track to the loading station, where they are clamped automatically by a neoprene mandrel mounted on an air cylinder. Next the workholding fixture is indexed, elevating work into the blasting cabinet. To insure uniform removal of burrs, part is rotated continuously during blasting operation.

At completion of operation the part-holding fixture is again indexed, this time to the unload station. Here the workpiece is stripped from the fixture and slides down the exit chute for conveying to the next operation. Either manual or automatic loading and unloading can be used with the machine, which operates on normal plant air pressures. Air consumption per gun is 26 cfm at 70 psi.

Modern Industrial Engineering Co, 14230 Birwood Ave, Detroit 38, Mich

Coupling selection chart reduces time necessary to select a flexible coupling. Critical specifications are given for company's three types of couplings—roller chain, Morflex, and silent chain—and include bore-diameter range, NEMA frame numbers, and shaft sizes.

Morse Chain Co, Ithaca, NY

You change only the throw-away insert

. . . not the cutter body

WITH NEW V-R ALL-PURPOSE FACE MILL CUTTERS

- **Save downtime . . .**
- **Reduce lost production . . .**
- **Eliminate carbide grinding . . .**
- **Reduce carbide costs**

You get eight cutting edges with each V-R square carbide insert. Replacement and indexing takes but seconds, thanks to V-R's exclusive design. The single main screw controls the elevator which clamps the insert against the chipbreaker plate. A recessed socket in each end of the main screw makes insert replacement fast and easy, regardless of the position of the cutter. There is nothing to fall out, nothing to fumble with.

All parts are replaceable and interchangeable.

Inserts are Inexpensive . . .
Lost Production is Costly

You do not remove the cutter body when cutting edges are worn in V-R's rugged new all-purpose Face Mill Cutter. Precision ground square V-R carbide throw-away inserts index perfectly just by slipping them in position and tightening the main screw. When using a negative rake cutter, you get eight cutting edges on every insert. When the inexpensive inserts are used up, throw them away and replace with new ones.

V-R Face Mill Cutters reduce downtime, *completely eliminate carbide grinding* and save money. They are available in 4", 6", 8" and 10" standard sizes. Other sizes available to meet your requirements.

Ask for new Bulletin for complete information.

Call your local V-R Representative or Distributor, or write:

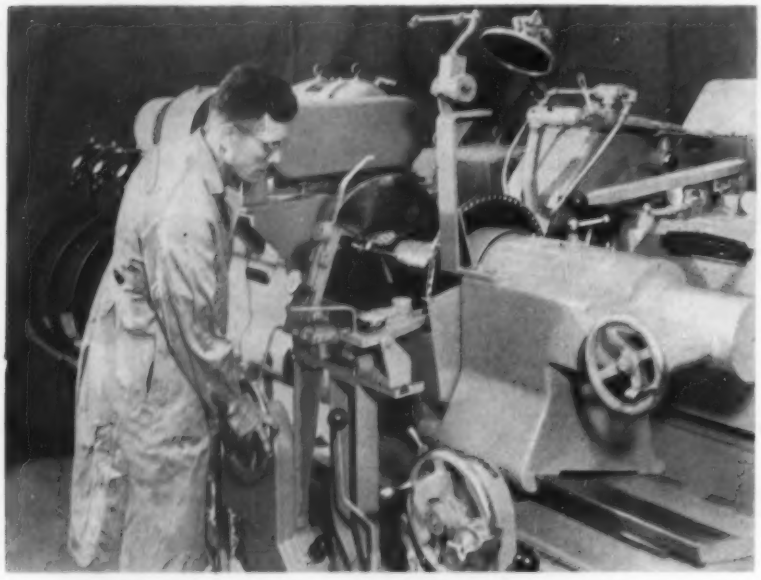
MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

Vascoloy-Ramet Corporation

SUBSIDIARY OF ROMSTEEL METALLURGICAL CORPORATION

806 Market Street • Waukegan, Illinois

FM-567



Large, Light Work Is Handled On Norton Cylindrical Grinder

Type LCTU semi-automatic cylindrical grinder is available in work lengths of 48, 72 and 96 in., and will handle work up to 30 in. in diameter. Machine is engineered for precision grinding of large work relatively light in weight.

Wide tables and ways provide rugged work support. Wheel spindles run in long full bearings, pressure lubricated. Automatic or manual wheel feed settings are speeded by means of "click-count" wheel feed index with feed increments as fine as 0.0001 in. in work-diameter reduction set without visual attention. Wheel feed is accomplished by a rotating-screw type automatic wheel-feed mechanism for maximum repetitive accuracy.

Automatic cycle is actuated with a single lever, and terminates either manually or by an electrically timed control. Jogging lever permits fractional rotation of work to the most convenient position for loading or inspection. A pre-set table-truing and grinding-speed control permits maintenance of separate table speeds for truing and grinding as set from the first workpiece.

Optional accessories include locating devices, automatic wheel truing, automatic compensation of wheelhead setting after truing, and a lever-operated device which moves grinding wheel into a shoulder to be ground.

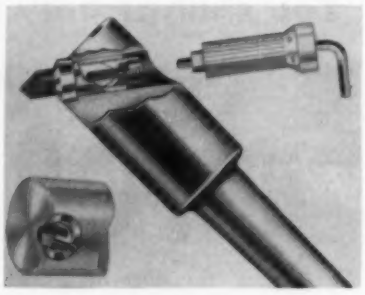
Norton Co, Worcester 6, Mass

Portable Marking Machine Reproduces Inspectors' Symbols

Portable Airgrit marks delicate, precision, or thin-walled parts without danger of fracture or distortion. Etched impression is left on surface of part by blowing fine abrasive grit through relieved portions of a rubber mask.

Made to specifications, mask can be interchanged quickly for different markings by snap-fitting over nose of unit's gun. Both depth of marking (settings can be made for marking depth as little as 0.001 in.) and time cycle are controlled. Finger pressure on operating button located on holding handle of gun actuates marking cycle. Portable hose and gun attachment is easily moved about; metal cabinet which supplies the grit is connected to shop airline.

Jas H Matthews & Co, 3982 Forbes St, Pittsburgh 13, Penna



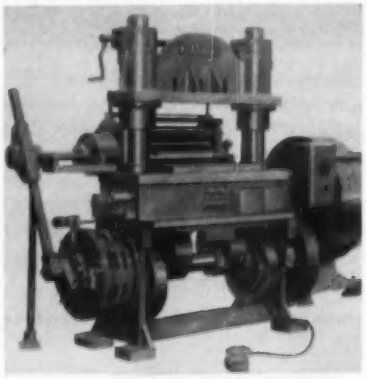
Micrometer Cartridge Adjusts Boring Bit

Boring bar cartridge, called Acra-Bore, can be installed by drilling two holes, reaming one and counterboring the other, and pressing cartridge into the tool. Device provides micrometer adjustment and positive positioning, rigid clamping with no backlash in either direction for precisely projecting and retracting the toolbit to its original accuracy.

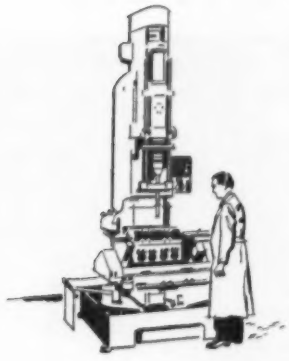
Adjustment of toolbit is controlled by a graduated styrene plastic wrench which suits the hole space. There are no graduations on the cartridge to wear off; one mark or graduation is all that is needed on the bar or tool proper.

Three sizes of cartridges are available. Toolbit sizes are ¼, ⅜, and ½ in.; ¾-in. size will be available later. For each of the three sizes a unit is provided that is mounted 90° to the axis of rotation and a unit mounted 53° to the tool axis.

Gairing Tool Co, Hoover Rd, Detroit 32, Mich



MULTI-MAX PUNCH PRESS, Model 5024, has feed mounted on bolster plate to feed aluminum-foil coil stock 24 in. wide; advance is from 0 to 14 in. Unit has 5-in. stroke, operates at adjustable speed from 60 to 125 spm; rated capacity is 50 tons—*Diamond Machine Tool Co, 5111 Coffman-Pico Rd, Pico, Calif*



"Today... Rejection rate is NIL!"

A large Midwest pump manufacturing company had run up against an expensive finishing problem. They were using a super finisher with an abrasive stone to cut and polish 410 stainless steel shafting to a four micro finish. The hardness of the shafting was Rockwell B60-90. Although they tried a number of honing fluids recommended by various companies, the rejection of finished shafting was high and stone life was short. On a routine call, Sinclair Industrial Representative P. W. Stevens was asked for his recommendations.

Light-bodied coolant recommended...

Mr. Stevens reports, "Examination showed the need for a light-bodied coolant specifically designed for use as a honing fluid for both ferrous and some non-ferrous metals. From previous experience with a similar problem, I recommended Sinclair HONOL Medium."

Problem solved...

Mr. Stevens continues, "The company tried Sinclair HONOL Medium on a test basis. A follow-up showed they were getting exceedingly fine finish and accuracy, with sufficient carry-off of steel particles during the honing operation. The amount of heat generated was kept to a minimum, thus preventing distortion of parts. The company reports that today their rejection rate is nil. Moreover, all pieces have the desired four micro finish, and stone life has increased considerably. This manufacturer now specifies Sinclair HONOL Medium for his finishing operations, and uses the same product for honing brass."

Why not let a Sinclair Lubrication Engineer help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y.

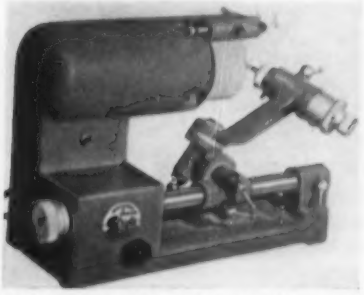
SINCLAIR LUBRICANTS

Comparator Charts Are Drafted On Precision Layout Machine

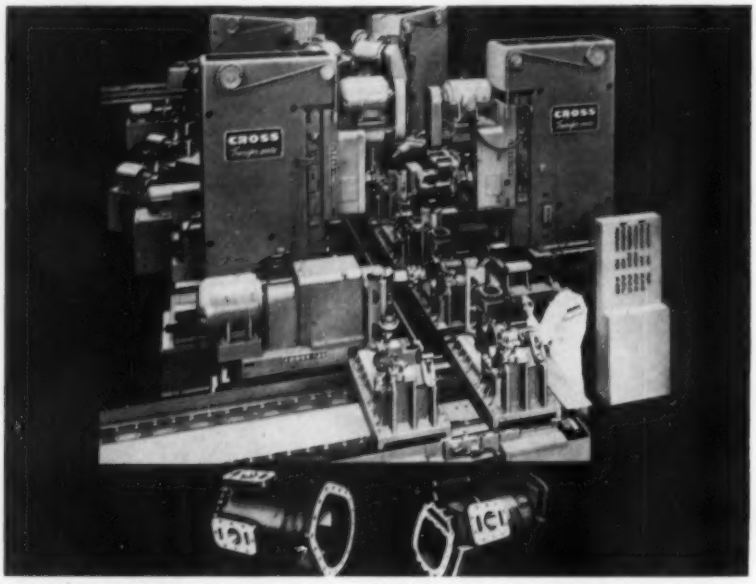
The Wichmann layout machine, a product of Germany, features two highly precise straight-edges interconnected for cross and longitudinal travel. Machine is used for the precision layout of charts as used on optical profile grinders, comparators, and similar units using magnified drawings of parts and contours.

Machine permits a plotting accuracy of ± 0.002 in. over the whole area. Equipment includes a wooden table with individually height-adjustable legs, cast-iron machine base, and machined carriages. Turntable to permit angular layouts is also offered. Machine takes paper, plastic film, or glass plates; plotting is done with scriber, pen, or pencil. Scales, consisting of bands and fine-reading dials, are interchangeable, and any magnification can be supplied.

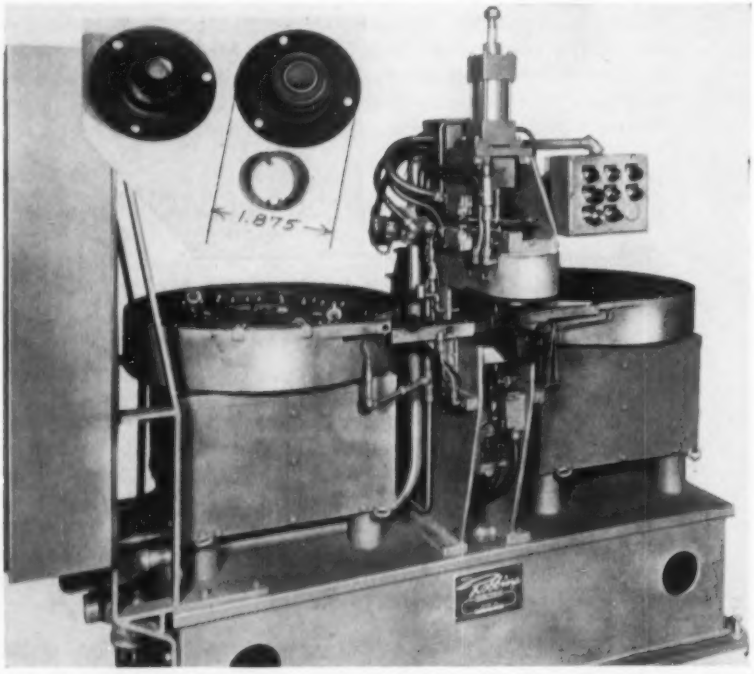
Imported by Eric E Bachmann Co, Inc, 37-11 41st Ave, Long Island City 1, NY



SCRIPTA AL.3 AUTOMATIC SHARPENING MACHINE restores blunted engraving cutters, and can be used to produce complete range of original contours from uncut milling tool stock. Cutters need not be removed from chuck-mounting—*Imported by W A Wolf Machinery Co, 2910 Santa Fe Ave, Los Angeles 58, Calif*



AIR-CONDITIONING HOUSINGS are machined from rough castings to assembly by special Transfer-matic, which performs 159 separate operations: 6 milling, six boring, 1 facing, 81 drilling, and 65 tapping. Two-position palletized workholding fixtures carry parts from station to station. To provide for flexibility in design changes, replacement, and repair, building-block construction was used—*Cross Co, Detroit, Mich*



AUTOMOTIVE WINDOW-LIFT COMPONENTS are fed, positioned, assembled and unloaded without an operator on special automatic assembly machine. Assembly consists of a coil spring and a stamped housing; hook on spring end must be oriented in proper relation to pierced holes in housing flange. Parts are fed by vibratory hopper feed from opposite sides of machine. Production of 1440 assemblies per hr at 90% efficiency is controlled by electronic timer—*Omer E Robbins Co, 24800 Pymouth Rd, Detroit 38, Mich*

Chances are at least **98 out of 100** that this part will be **perfect**

The Metal Stampings Plant, Sylvania Electric Products, Inc., keeps rejects under 2%—even on complex, close-tolerance parts produced at rates to 9,000 per hour. Optical gaging helps set this level.

The diode plate shown above is an example of the complex, mass-produced, parts turned out to close tolerances by The Metal Stampings Plant, Sylvania Electric Products, Inc., at York, Pennsylvania. Tolerances run to ± .001"; as many as 10 dimensions must be held, including inner and outer diameters. Yet even on parts more difficult than this—parts with tolerances of .0005" and forming rates of 9,000 per hour—Sylvania gets an acceptance rate of over 98%.

Inspection on Kodak Contour Projectors helps Sylvania do the job to the satisfaction of its customers, both internal and external. Operators check the first parts produced by every machine to assure correct setup. Then, throughout the run, production samples are checked at regular intervals—making certain each machine is holding to tolerance. The speed with which these parts can be checked using optical gaging methods has helped slash rejection rates more than 50% since Kodak Contour Projectors were installed.

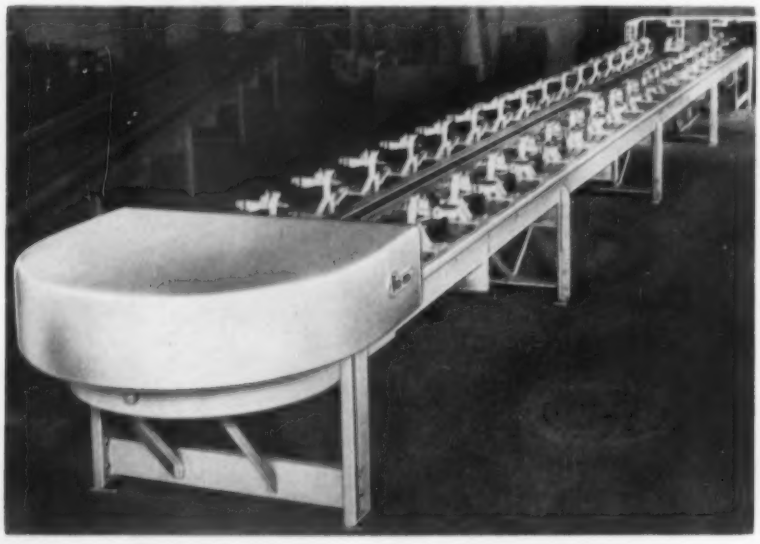
If you have difficult inspection problems involving quantity, speed, close tolerances or hard-to-measure dimensions like shoulders, holes, radii or angles, there's every reason to expect a solution by optical gaging on a Kodak Contour Projector. There's a representative in your area who can tell you more. To get in touch with him, or for a copy of the booklet, "Projection Gaging with Kodak Contour Projectors," write Special Products Sales Division.

Little training is required to operate a Kodak Contour Projector. Operators sit comfortably in a fully lighted room. The work gets out in a hurry.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE-MARK



Visi-Trol Platen Conveyors Adapt To Variety of Applications

Steel-clad platen conveyors in Carrousel line are obtainable in any length (in 10-ft multiples) up to 100 ft, with automatic indexing and adjustable dwell for work cycle. Working height is 38 in., adjustable up or down 2 in. Width is 4 ft and can be varied to specifications. Heavy-duty 10 x 12-in. carrier platens support up to 100 lb and are drilled and tapped to order; platens are on 12-in. centers.

Entire top of conveyor is clear, permitting easy installation of attachments. Power is supplied by a hydraulic indexing unit which operates at 800 psi and is driven by a 2-hp motor.

40-ft unit illustrated is tooled for the assembly of automotive transmission valve-body assemblies. It has 86 carrier platens, of which 80 are always usable. Fixtures are mounted on alternate platens, and index is 24 in. in 3 sec with adjustable dwell for work cycle. Fixtures feature automatic clamping and are also indexed radially in 90° increments manually. Production rate is 400 per hr at 100% efficiency.

Parts-pan support rail is standard on all models. Optional features include automatic lubrication, clamping-unclamping, load-unload, and off-line handling and storage equipment.

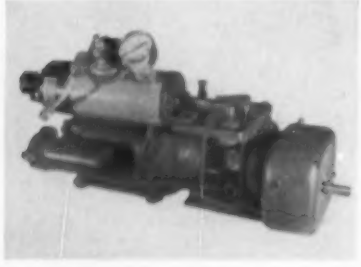
Visi-Trol Engineerng Co, 9345 Hubbell, Detroit 28, Mich

Clearing Press Control Provides Flexibility for Various Setups

Flextrol arm is a device which helps press operator to overcome problems connected with repositioning controls on different die setups. Top ball pivot, attached to press, permits arm to be swung outward and to either side. The arm telescopes, using a rack mechanism. Run-button bar, made of cast aluminum for lightness, is mounted on a swivel and is locked by a single lever.

Pedestals designed for use with the run-button bar are also available. They feature a heavy steel base and telescoping shaft with rack mechanism for height adjustment.

Clearing Machine Corp, U S Industries, Inc, 6201 W 65rd St, Chicago 38, Ill

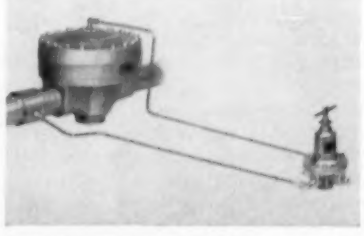


Automatic Speed Control Fits Graham Variable-Speed Drives

Designed for use with Graham 29 Series transmissions, air control system for fractional-horsepower variable-speed drives can be had on drives delivering speeds from any desired maximum down to zero and, if desired, reverse. Linear speed vs pressure characteristic is standard with most models, but square-root function and other characteristics can be had.

Illustrated is a ¼-hp unit with pneumatic operator and built-in helical spur reducer as well as built-in single-phase, explosion-proof motor. Pneumatic control operates on a 3-to-15-psi signal, with control signal originating from liquid-level, pressure, or flow-rate devices or a variety of other transducers. Normally zero speed is obtained at a control pressure of 3 psi with maximum speed at 15 psi; however, control can be installed to produce zero or any other speed at 15 psi.

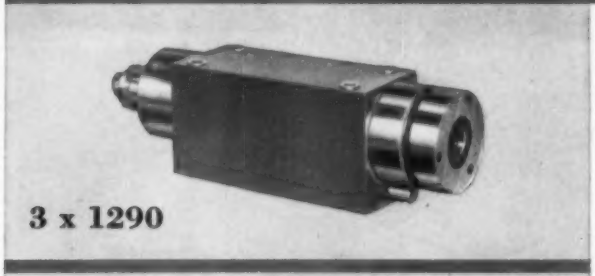
Graham Transmissions, Inc, Menomonee Falls, Wis



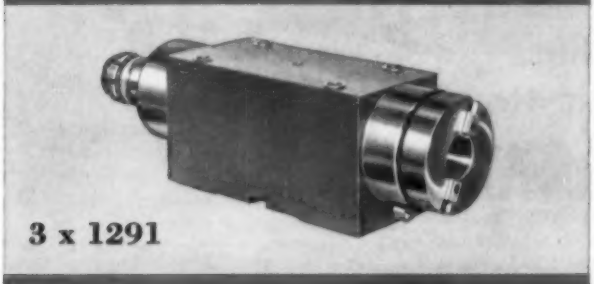
AIR-PRESSURE REGULATOR, Model 20AA-16, is a 2-in. pilot-controlled device for precision air control, reducing line pressures of up to 400 psi to working pressures of from 2 to 125 psi. Temperature range is from —40 F to 200 F. Features include balanced valve construction, pressurized control chamber which eliminates spring housing, and remote-control provisions—C A Norgren Co, 3436 S Elati, Englewood, Colo

PARKER SPINDLES

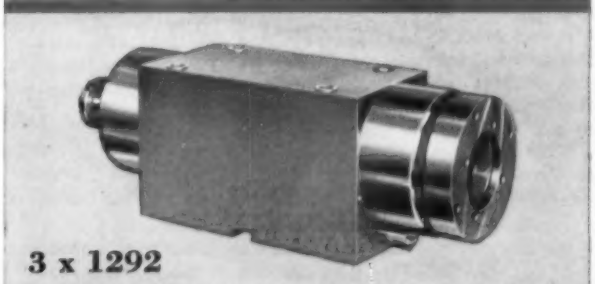
FOR PRECISION BORING, MILLING AND GUN DRILLING APPLICATIONS



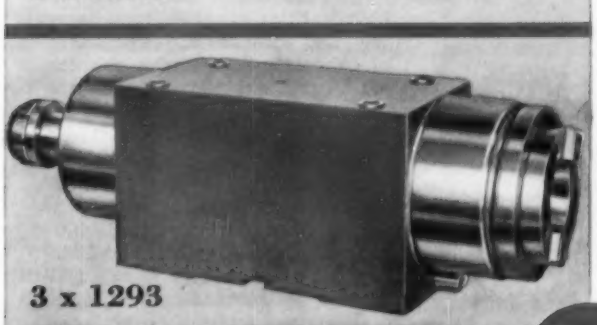
3 x 1290



3 x 1291



3 x 1292



3 x 1293

Versatile—Economical

NO BETTER REASON for the success of Parker-Majestic in the design and manufacture of machine tool equipment can be found than in the acceptance of its versatile 3x1290 series of standard boring, gun drilling and milling spindles.

●

FOUR BASIC BODY SIZES, with modifications of spindle shaft and bearing design, make possible more than 75 spindles, for almost any application in which spindles are used, with speed ranges from a few RPM up to 10,000.

●

YOUR CHOICE OF SHAFTS: 1. Flange head, no shaft hole; 2. Flange head, shaft hole with rear I.D. threaded for rotary coupling; and 3. Milling machine taper head with shaft hole for draw bar.

●

MILLING MACHINE TAPERS are No. 30, 40 or 50, depending upon size of spindle.

●

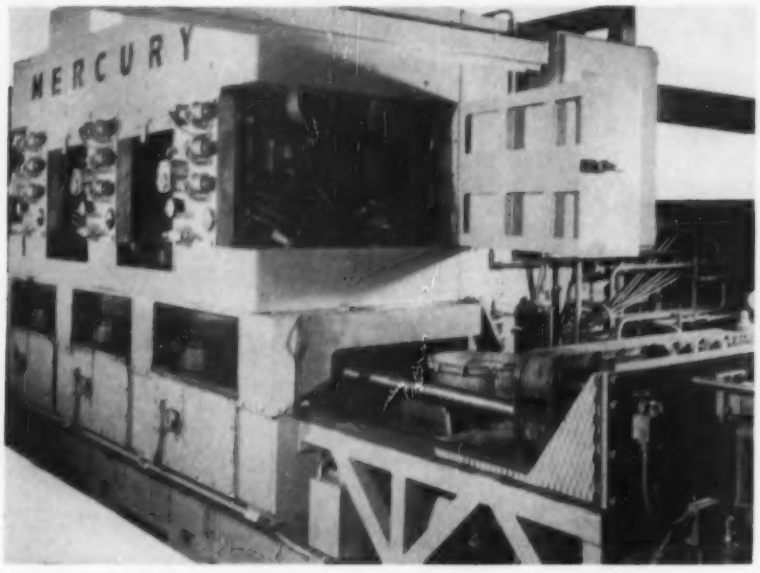
DESIGN STANDARDIZATION gives you advantages of economical prices, prompt delivery.

●

WRITE TODAY for complete information, giving application, material, finish required, amount of stock to be removed. Also send part print, if possible.

PARKER-MAJESTIC PM **PRECISION MACHINES**

147 Joseph Campau • Detroit 7, Michigan



Mercury Transfer Grinding Machine Handles 240 Automotive Parts Per Hour

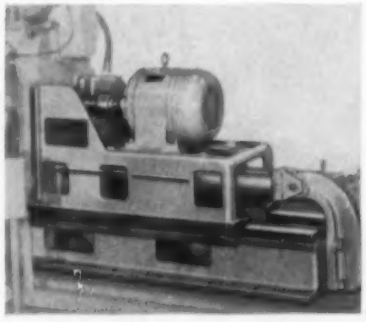
Operated by only one man in the loading station, special transfer grinding machine can produce 240 transmission converter housings per hr, ground on the front and rear mounting faces, at 100% efficiency. Unit, built for Ford plant at Livonia, Mich, removes approximately 0.1 in. of stock from each face to be ground.

Machine sequence for the required operation is as follows: work is loaded with bell end up; bell end of housing is rough-ground, removing all but 0.06 in. of stock; work is semi-finish-ground, leaving 0.015 to 0.020 in. of stock; work is finish-ground to size; work is indexed 180° so that transmission-mounting face of housing is up; process is repeated with this end of work, through rough-grind, semi-finish-grind, and finish-grind; work is unloaded. Illustration shows loading station, with casting in position, ready to be picked up by transfer bars and transferred into the first grinding station.

Where the bell end (or motor-mounting face) of the housing is being ground, nests are provided, together with clamps, to position work; work is rotated, and grinding wheels remove a predetermined amount of stock. In grinding station which machines other end of casting, locating nest and rest pads are provided to contact and hold the surface previously machined.

Two separate drives for the work spindles are provided. Each drive has its own stopping mechanism and its own variable-speed fluid motor. Grinding heads used feature company's parallelogram design, with all working parts completely sealed. Heads are provided with a hydraulic feed which can be varied to increase or decrease rate of feed. Machine is provided with automatic size control and automatic compensation for wheel wear. Air gages at loading station tell operator the exact condition at each of the six grinding stations.

Mercury Engineering Corp, 2100 N Farwell Ave, Milwaukee 2, Wis

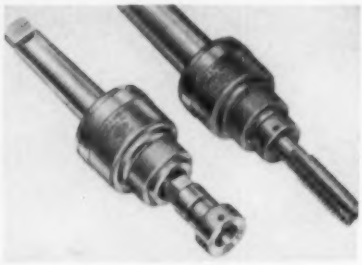


Way-Type Hydraulic Feed Units Develop 12,000-lb Thrust

Series 20-400 and 20-401 horizontal and vertical units are designed to provide thrust above the ways near the tool load. Depth will repeat within 0.0005 in.

Flange is designed to simplify mounting and aligning of multiple spindle heads; 15-in. stroke assures ample tool change clearance. Feed rate is infinitely variable from 0 to 24 ipm, rapid advance is 8 ips, rapid return, 5 ips. Rapid advance and feed stroke lengths are adjusted by repositioning control dogs. Multiple spindle drive motors up to 20 hp can be mounted on the saddle.

Hartford Special Machinery Co, 282 Homestead Ave, Hartford 12, Conn



Roller-Type Floating Holder Has Interchangeable Collet

Features of toolholder include extra bearing capacity to withstand heavier thrust loads, and an interchangeable collet, snap-ring mounted and driven by a hex shank and socket machined into the main tool body. Internal adjusting setscrew behind the collet permits presetting the cutting tool.

Two types of interchangeable collets are provided, one for taps and one for reamers. Floating holders are available in all shank types and in a range of sizes.

Seibert & Sons, Inc, Chenoa, Ill

Dynac Computing Indicator Gives Direct Readings

Model DY-2500 computing indicator can give precise measurements of such quantities as speed, rpm, pressure, and thickness, eliminating time-consuming conversion calculations. Device is an electronic counter with a variable gate time that functions as a multiplier of transducer input to provide direct readings.

Front panel plug-in board is provided for automatically setting any predetermined conversion multiplier. Gate time may also be selected manually and is adjustable from 0.0001 to 0.9999 in 0.0001 sec increments. There is also provision for a second input to permit measuring ratios of two independent variables and direct readings of such quantities as engine revolutions per gallon. Pushbutton on panel permits quick check of proper operation.

Dynac, Inc, Div of Hewlett-Packard Co, 395 Page Mill Rd, Palo Alto, Calif

"You say I can see vibration, measure it, and eliminate it?"

1 "How much vibration do you think my machine has?"

No need to guess—the Veelos Vibration Analyzer shows exactly! This amazing electronic tester measures vibration amplitude down to *2-millionths of an inch*—tests one belt against another, actually shows which belt has "invisible shakes" . . . and how much! Don't guess about vibration; it's costing you hard cash every minute you ignore it. Ask your Veelos salesman to test your belts with the Vibration Analyzer.

2 "Isn't vibration caused by a number of things?"

Vibration can be caused by bearings, motor, clutch, sheaves or V-belts. Quite often it is caused by V-belts alone. The Veelos Vibration Analyzer uses a "strobe" light which "stops" the motion—shows exactly *what* is vibrating! It shows you precisely how much vibration you're paying for, and lets you correct it. The Vibration Analyzer gives positive proof, and the test takes only 15 minutes. It's free, of course.

3 "How do I eliminate costly belt vibration?"

Install Veelos, in place of ordinary V-belts! V-belts have spots of varying density, due to their construction, which throw them out of balance. Veelos belts are absolutely uniform; every stud and link is identical; *every foot of the reel* is identical and uniform; and they're perfectly balanced! Test any belt for vibration against Veelos—you're in for a shock. Your Veelos salesman will show you how to cut costs and improve your operation.

© M.M.&B. Co. 1956

VEELOS
THE BALANCED
LINK V-BELT

Veelos is known as Veelink outside U.S.A.

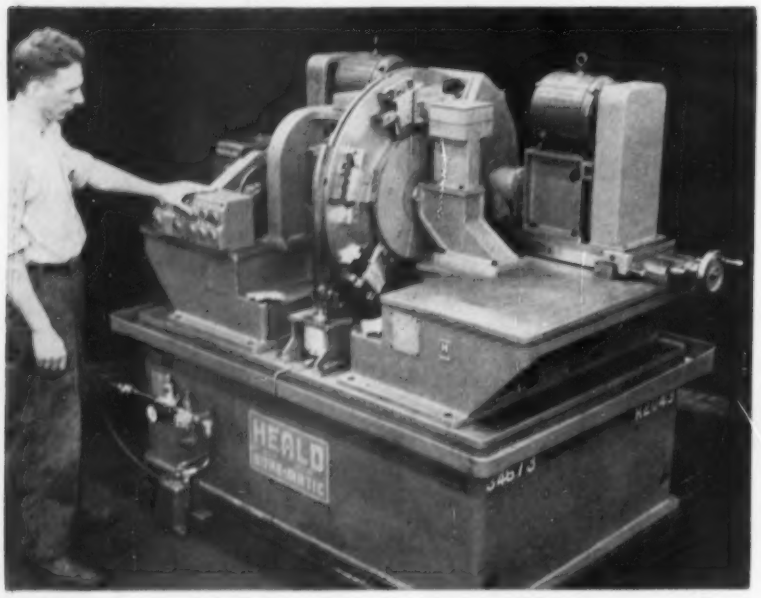
For free vibration analysis or Veelos Data Book write to:

MANHEIM

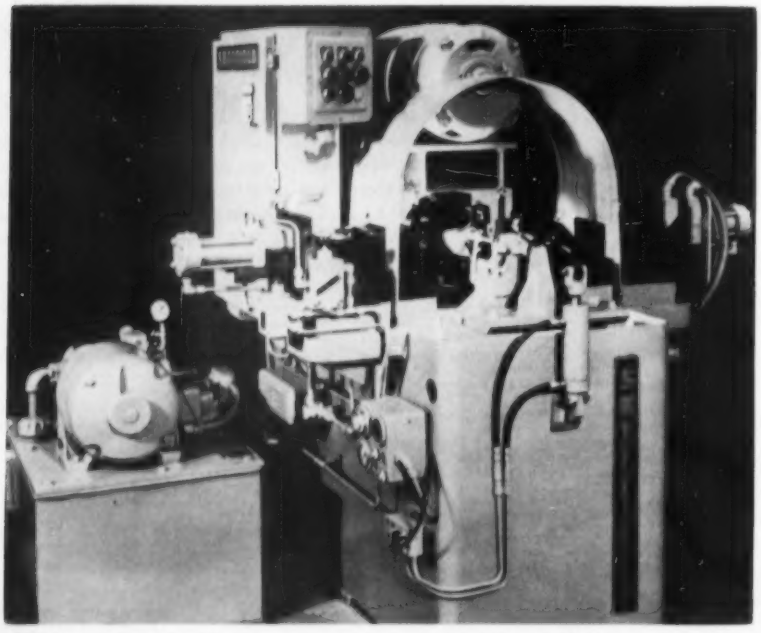
Manufacturing & Belting Company
201 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

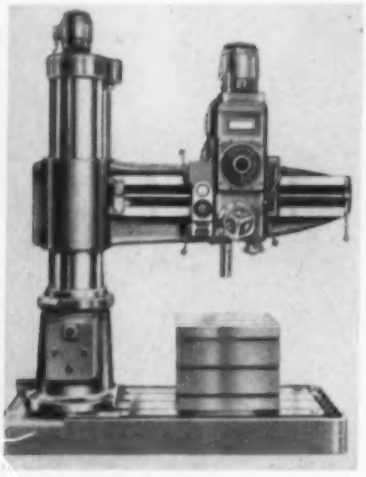
Adjustable to any length • Adaptable to any drive • Balanced power • Constant power • Vibrationless power



AUTOMOTIVE AUTOMATIC-TRANSMISSION PARTS are machined on special Bore-Matic, which provides valve-body production at a rate of 270 parts per hr at 75% efficiency. A constantly rotating trunnion-type fixture moves parts in a circular path between and at right angles to the two boring heads; 12-station fixture rotates at approx ½ rpm, producing two finished parts every 20 sec. Tooling consists of two multiple toolholders, each carrying 8 single-point carbide facing tools. Boring heads to which toolholders are fastened are slide mounted. Facing operation removes 0.050 in. from aluminum part — *Heald Machine Co, Worcester 6, Mass*



BICYCLE-CRANK THREADS are rolled on special Sheffield-Murchey machine which consists of a floor-type base on which are mounted two of company's Precision-Rol units operated by a hydraulic sub-slide assembly. Crank is loaded between centers and clamped; operator pushes button to actuate rolling of both right- and left-hand threads in an automatic cycle. Rate of production is about 120 per hr—*Sheffield Corp, Dayton 1, Ohio*



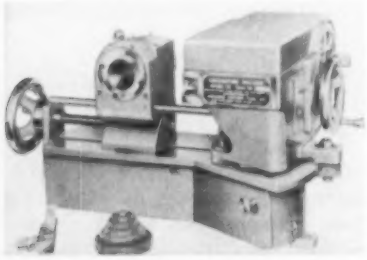
Italian Radial Drills Offered in Four Models

Starrett radial drilling machines, imported from Italy, are available in 3, 4, 5, and 6-ft models. Units offer 12 spindle speed changes, with 6 mechanical feeds for every speed. All moving parts are automatically lubricated by a pump placed inside the saddle.

Baseplate is built in box form, completely closed and strengthened with webbing. Column is made in two parts: internal section is fixed to the baseplate, external (on which arm slides) is finish ground. At lower end a roller bearing takes up radial forces.

Vertical arm movement is through a 4-spoke handle, fitted on the saddle, which controls a special motor driving the lift screw through a gear reduction. Means are provided to prevent accidental falling of the arm. Only one lever is required to lock saddle, arm, and column.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY



CIRCULAR GRADUATING MACHINE for machine-tool dials and hand wheels will graduate straight or angled surfaces from 40 to 1000 with many combinations of length or line —*Abrasive Machine Tool Co, East Providence, R I*

SAVE with SHEFFIELD

ADJUSTABLE
BALLJET
SPINDLE KIT
1" TO 3"

ADJUSTABLE
AIRBORE GAGE KITS
½" TO 12"

Here is a Short Run Job . . . 50 Shafts Like This to be Ground to a Tolerance of .0006"

The Adjustable Airsnap and Precisionaire shown, provide the absolute dependability of high—amplification air gaging which tells the operator exactly what he is doing all the time—prevents scrap.

At the same time, there is no cost penalty for single-purpose air gage tooling. This Airsnap is adjustable. It can be used just as effectively on the next job providing the new gaged diameter falls within the adjustment range—in this case, one inch.

Adjustable air gage tooling is available for the inspection of internal dimensions from ⅝" to 12"—for external dimensions up to 36". **Write The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.**

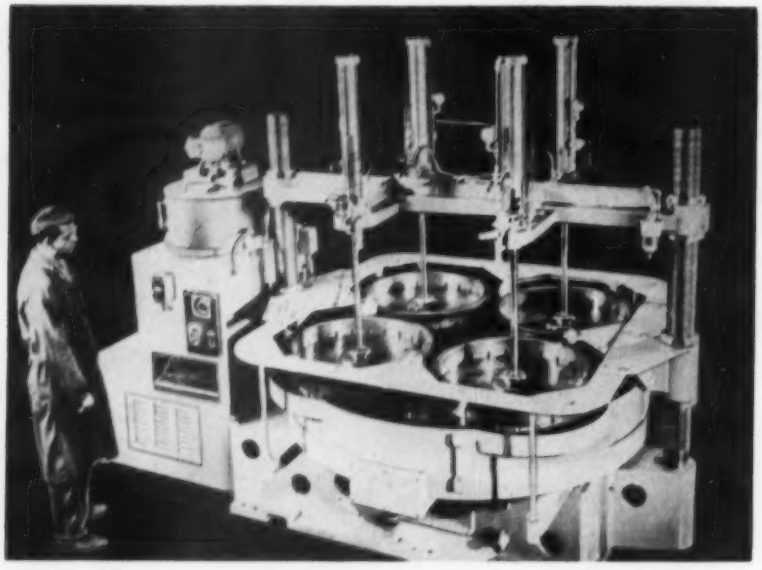
7447

GOLDEN ANNIVERSARY HEADQUARTERS

SHEFFIELD

manufacture and measurement for mankind

Check with Sheffield on the many savings of Adjustable Air Gage Tooling.



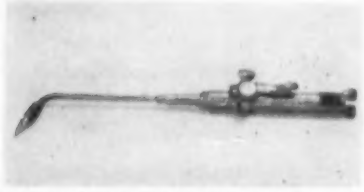
Lapmaster Lapping Machine Has Redesigned Pneumatic Lifts

Model 72 lapping machine has been redesigned to incorporate several additional features: spider-bar and roller-bar attachments have been improved, and an ammeter has been added as standard equipment. Spider bar is a two-stanchion set-up and has been thoroughly ribbed on the underside to withstand all pressure the pneumatic cylinder can produce; this arrangement prevents binding from taking place in the guide ways when the pressure plate and conditioning rings are lifted. Two adjustable supports have been added to the roller bar, keeping it on an even plane so that it can be stacked with parts during loading or unloading.

Ammeter warns operator when the machine is being overloaded, also indicates how much pressure can be added from the pneumatic lift assembly, and shows whether or not the solenoids are operating properly.

Capacity of model ranges from four 27-in.-dia parts up to 2480 1-in.-dia parts per load. Unit is reported capable of generating surface flatness to less than one light band and finishes to 2 rms in short or high-production runs. Materials handled include cast iron, steel, brass, magnesium, aluminum, glass, and plastics.

Crane Packing Co, Dept AMN, 6400 Oakton St, Morton Grove, Ill



Air Reduction Welding Torch Features Quick Shut-Off Valve

Airco Style 600 shut-off torch, designed for production and light-gage welding and brazing jobs, weighs only 14 oz and is 7¼ in. long. Complete line of tips, mixers, and extensions is available for use with tool.

Quick shut-off valve permits instantaneous closing of gas passages so that operator can move from one weld joint to another without loss of oxygen or acetylene and without carrying a live flame from one area to another. Control lever is located between gas valve knobs on handle.

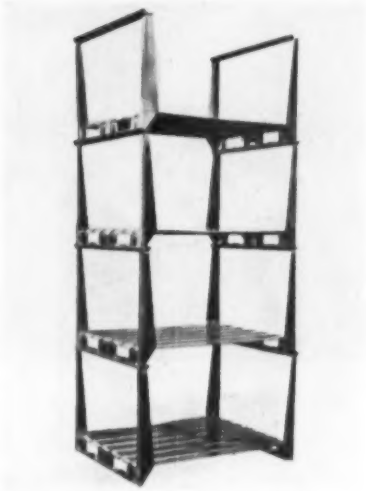
Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42nd St, New York 17, NY

Automatic Load-Unload Mechanism For Metalfinishing Operations

Rapid loading and unloading of metal parts to and from automatic metalfinishing machines is handled by automatic load-unload mechanism, which operates between finishing machine and a monorail conveyor, loading and unloading work racks on the same indexing sequence as the finishing machine. System is particularly recommended at installations where short dwell periods prevail, because the automatic transfer unit keeps pace with the metalfinishing cycle.

Loader is designed to shuttle on a pair of rails between finishing machine and the monorail. At top of loader are two double stations, one for loading and one for unloading. As one batch is completed in finishing machine, mechanism retracts, finished parts are deposited on monorail, then raw parts are picked up from monorail and carried into finishing machine.

Hanson-Van Winkle-Munning Co, Matawan, NJ

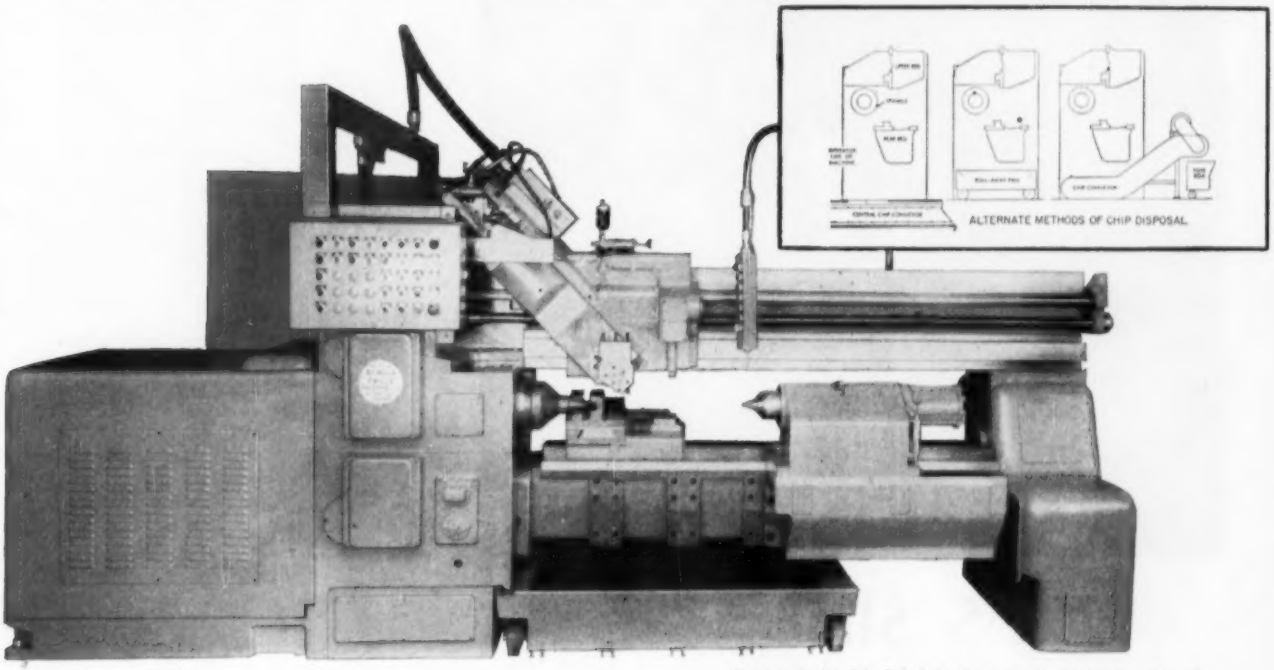


PORTABLE STACKING RACK, open-side steel frame units, can be moved by fork lift or platform truck. Racks are made to specification according to size and shape of material to be handled—*Republic Steel Corp, Pressed Steel Div, 6102 Truscon Ave, Cleveland 27, Ohio*

Powered plastic composition called Epocal is primarily intended for use as a face coat for expendable plaster or gypsum cement casts which are to be used for laminates or castings. Its use is reported to reduce the problem of separating epoxy laminates or castings from the mold. Applications include use as face coat for plaster casts that are to be used in the fabrication of plastic jigs and fixtures or plastic-faced metalforming dies.

Furane Plastics, 4516 Brazil St, Los Angeles 39, Calif

A BETTER METHOD OF MACHINING REAR AXLE, AND OTHER SHAFTS



Seneca Falls Model AQ Automatic Lathe Equipped for Flange Turning Operation on Rear Axle Shaft. 60 H. P., Net Wt. 25,000 Lbs. Also Model LQ, 30 H.P., Net Wt. 20,000 Lbs.

● The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The line drawing shows a machining operation on the stem end of a rear axle shaft which is rough turned with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

The machining operation is completely automatic . . . the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.

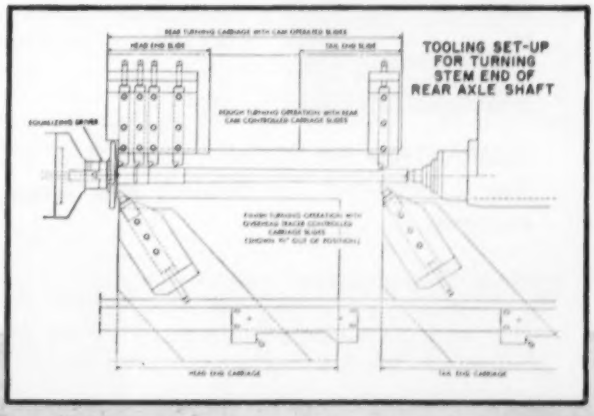
A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements,

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

Write for Bulletin Q-56-A

DESIGN FEATURES

- ▶ **Simplified changeover features for reduced set-up time.**
- ▶ **Feed rate may be automatically changed during cutting cycle.**
- ▶ **Streamline design for efficient chip guarding.**
- ▶ **Screw feed to all carriages.**
- ▶ **Four speed head with automatic change-over.**
- ▶ **Large chip flow area.**
- ▶ **All templates clear of chip area.**
- ▶ **All ways hardened, ground and replaceable.**
- ▶ **Open front design facilitates loading and unloading.**
- ▶ **Straight line diameter adjustment for tracer tools . . . no shoulder length change to correct.**



NEW SENECA FALLS
MODEL LQ AND AQ AUTOMATIC LATHES

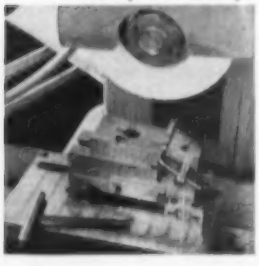
J & S SINE VISE

". . . the most practical precision vise ever developed . . . saves 25% in time . . . (on die sections and intricate parts)"

says MEDVED TOOL & DIE COMPANY
Milwaukee, Wisconsin

Here's Why . . .

- Vise is square within less than .0001" in 1", in 4 positions.
- Clamping jaw of vise SWIVELS, holds tapered and odd shaped work pieces.



- Down holding clamping feature.
- Stop, for accurately repeating position.
- Rapid loading and unloading.
- Attachable to sine angle plate in six different positions.
- Sine plate has .100 recess for small angles.

GUARANTEED PRECISION . . . Every J & S Clampcut Sine Vise is Hardened and Ground, then Stabilized in Liquid Nitrogen.

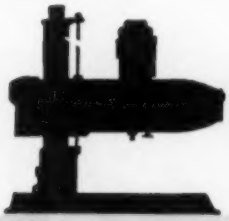
J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC.
870 DORSA AVE.
LIVINGSTON, NEW JERSEY

ELASTOMER PUMP LINER, called Kel-F, is designed for use with company's pumps. Illustration shows cutaway view of pump fitted with liner. Flexible liner is said to afford exceptional resistance to acids, alkalies, most solvents, and various types of fuels and hydraulic fluids—*Vanton Pump & Equipment Corp, 201 Sweetland Ave, Hillside, NJ*

Safe-Feeds-and-Speeds Chart is designed for use with high-speed drills, and shows correct feeds and speeds for several drill diameters in machining cast-iron, bronze, brass, drop forgings, alloy steel, and annealed tool steel. Copy of chart is available if requested on company letterhead. *Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill*

VACUUM HEAT TREATING FURNACE facility is available to shops whose requirements do not necessitate purchase of their own unit. Model 2936 has resistance-heated uniform hot zone 36 in. in dia, 36 in. high. Max working temp is 2000 F, min pressure 0.5 microns—*NRC Equipment Corp, Newton Highlands, Mass*



NEW HEAD CONTROLS make Fosmatic Radial easier than ever to run!

Numerical Dials select feeds and speeds quickly, easily, with minimum possibility of error. Select even while drill is running, to save time on next operation.

Single Control Lever starts, stops, reverses and shifts to feed and speed set on numerical dials.

Push Buttons on quick return levers engage feed. Feed is disengaged automatically by depth control or by pushing either button again. Magnetic clutch needs no adjustment.

Head Traverse Lever also elevates arm. Variable speed hydraulic motors drive both traverse screw and elevating nut. Clutches eliminated.

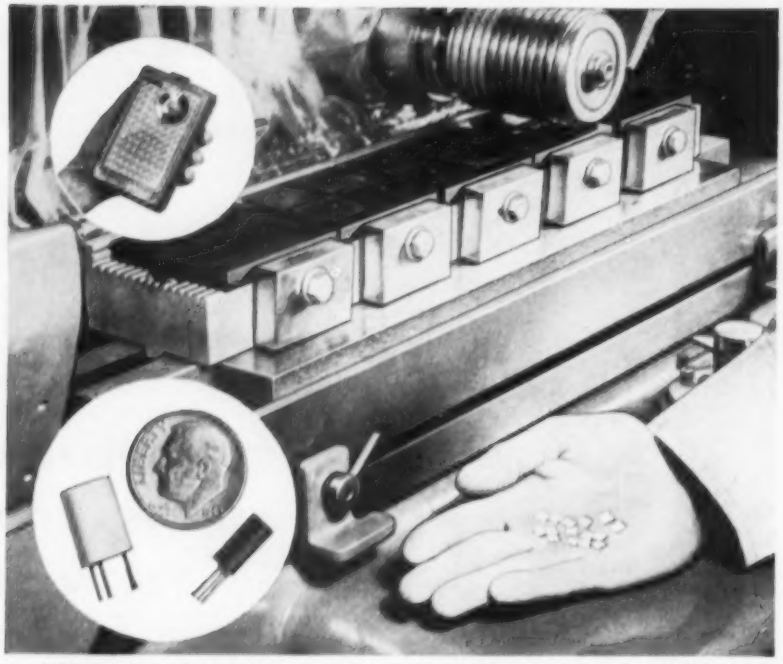
Other Fosmatic features include: 36 spindle speeds, 18 feeds, 4' to 8' arms, 13" to 19" columns, Boring Type Spindle, Safety Interlocks, Variable-Tension Counterbalance for Spindle, and optional Milling Feed.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK



Micromatic precision slicing machine slices and dices germanium and silicon ingots into wafers for use in tiny transistors.

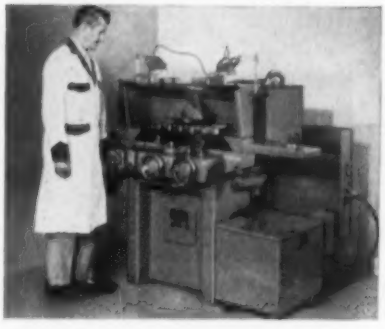
Tooling for the Transistor

Mighty Midget of Modern Living

Vest pocket radios that run on heat . . . tiny hearing aids that defy detection . . . solar batteries charged by the sun—these are benefits of the transistor, pint-sized power house that replaces bulky "radio tubes" in many applications.

Those who preach against profit will be happy to use these remarkable products of the American economy. Yet, take away the profit and the products would remain unborn.

Production of transistors graphically portrays this economic principle. Rare germanium, costing $400 per pound, is one of the expensive metals used in wafer form for transistors. Original methods of cutting these wafers wasted half the costly germanium. The answer was a special $9,000 machine designed and produced by The DoALL Company. It slices and dices the germanium and other brittle materials at high speed with a minimum of waste.



Because manufacturers had the courage to invest in such tools, production of transistors is increasing daily while their cost is decreasing. And, the people will soon have more new and improved electronic products at a price they can afford.

This couldn't have happened without tools. And profit is the payment to the owners for the use of their tools. Profit accounts for only about 5% of manufacturing income. Yet the tools that profits make possible do 95% of the work. No one is going to save money to invest in tools without chance of payment. A fair profit is essential to a continuously better standard of living for all.

ECONOMICS LESSONS REPRINTS. Reprints from this economics series, suitable for bulletin board use in classroom or plant, are available upon request to your local DoALL Store. Or write:

The DoALL Company
Des Plaines, Illinois
38 Local Sales-Service Stores

E-5

NEW SHOP EQUIPMENT

Oil Mist and Smoke Precipitator Services Variety of Machines

Oil mist and smoke generated by high-speed grinders, screw machines, and lathes is drawn through ducts into the Electro-Air Oil Mist Precipitator for elimination. In addition to reduced cleaning and maintenance cost, 90% of coolant oil can be recovered for re-use, manufacturer states.

Features include selenium rectifiers, and a single, ballasted circuit. Six models with either horizontal or vertical airflow are available in capacities of 800, 1350, and 2000 cu ft of air per min. Single unit can be mounted over one machine or in connection with a bank of high-speed grinders or screw machines. Details contained in catalog OM-40.

Electro-Air Cleaner Co, 1285 Reedsdale St, Pittburgh 33, Penna

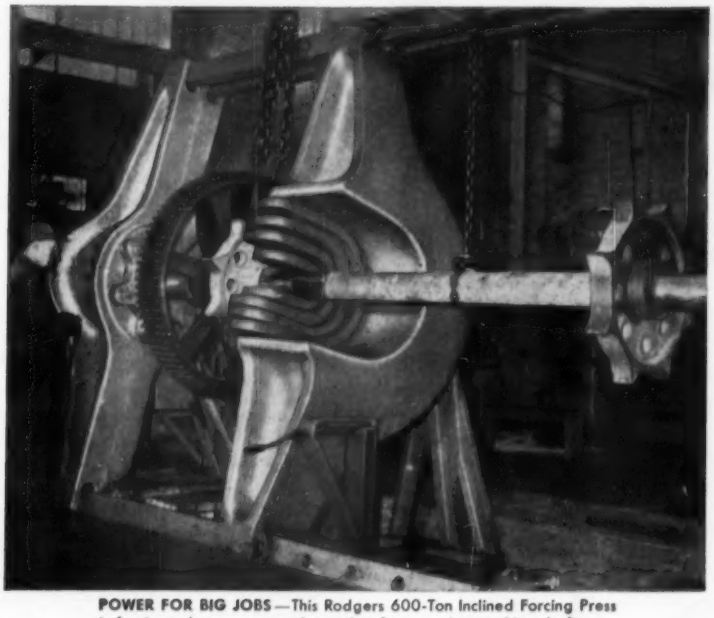
Cemented-carbide blanks added to Firlomet line include four types: lathe center blanks are carried in seven sizes ranging from ¼-in. dia x 7/16-in. long to ⅞ x 1⅜ in.; roll turning blanks are offered in 7 sizes, are also available in cast-iron grades; solid milling-cutting blades are stocked in 3 grades and 6 sizes; solid carbide cylinders are stocked in 16 sizes and in 4 grades, ranging from 3/32-in. dia x ⅜-in. long to ½ x 1½ in.

Firth-Loach Metals, Inc, Buttermilk Hollow Rd, McKeesport, Penna

Short-length power drills, offered in fractional and wire-gage sizes, are recommended for drilling sheet metal and stainless steels as well as for general-purpose drilling. Units are of the same specifications as screw-machine drills except for heavier webs which make them particularly suitable, according to maker, for use in portable machines.

Whitman & Barnes, 40600 Plymouth Rd, Plymouth, Mich

A MOUNTAIN of POWER



POWER FOR BIG JOBS—This Rodgers 600-Ton Inclined Forcing Press is forcing a large gear and sprocket from a mine machine shaft.

—or a touch of pressure

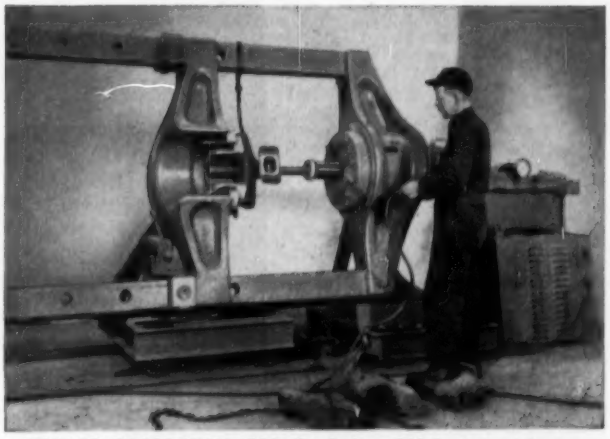
The heavy machines and equipment used in the great iron mining industry present a variety of problems when repair or maintenance is necessary. For this work the accurately controlled action of Rodgers Hydraulic Forcing Presses is a real time and work saver.

A Rodgers Forcing Press puts a mountain of power at your fingertips to force wheels, sprockets or gears from their shafts and for straightening, assembling, swedging or upsetting jobs. Operators also use the versatility, speed, power and positive control of a Rodgers Forcing Press to efficiently perform small pressing and forcing jobs with just a touch of pressure—tasks once done only on vertical shop presses!

you get both with RODGERS FORCING PRESSES

Rodgers vertical, horizontal and inclined forcing presses offer capacities from 100 to 600 tons . . . up to 9 feet between tension bars . . . up to 16 feet between ram and abutment . . . single or double acting cylinders with 13 or 26-inch ram travel (72-inch travel available) . . . electrically powered hydraulic pumps with selective, positive pressure adjustment and remote control . . . removable press cylinders that can be used in special jacking or pulling jobs . . . and many more features that assure you of dependable, long life operation—all fully described in this Rodgers Catalog Number 315A.

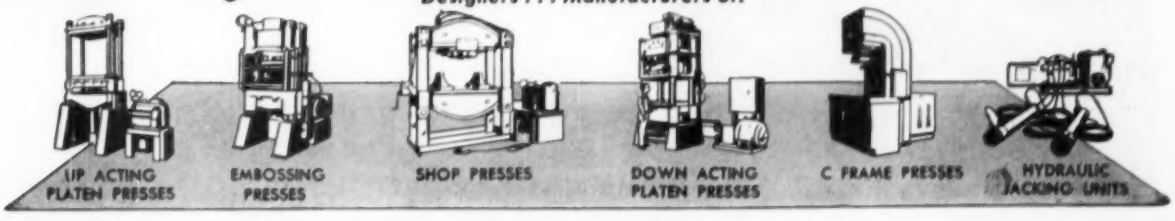
Write for it today!



LIGHT TOUCH FOR SMALL JOBS—This Rodgers 300-Ton Inclined Forcing Press is used on small as well as large equipment repairs. Here, a pin is being pressed out of a tractor idler support bracket.

Rodgers Hydraulic Inc. 7407 Walker Street, Minneapolis 26, Minn.

Designers . . . Manufacturers of:

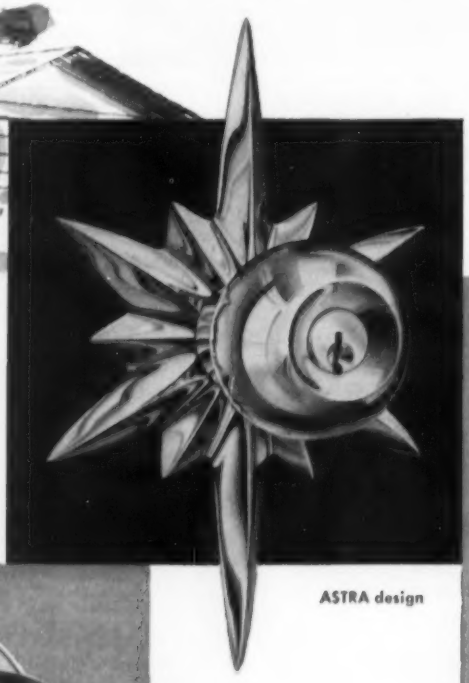


MUELLER BRASS CO.

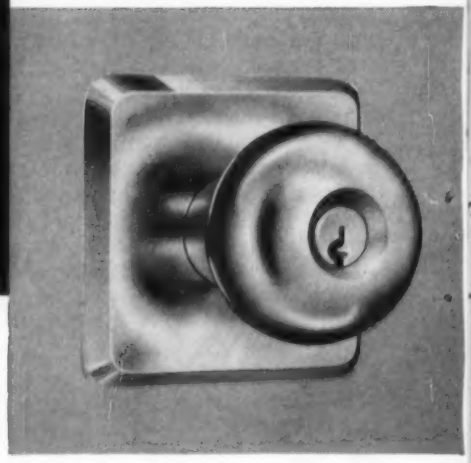
brass and bronze forgings help insure dependability and lasting jewel-like finish of distinctive SCHLAGE locks

Smart styling, handsome appearance and durability have been neatly combined by the Schlage Lock Company of San Francisco in their line of lock designs for residential and commercial use. Many important parts of these lock sets are brass and bronze forgings made by the Mueller Brass Co. The beautiful natural color, corrosion resistance, and inherent dependability of these forgings make them ideal for this purpose. In addition, the high degree of surface smoothness makes possible an exceptionally lustrous finish as well as a perfect plating surface when required. Then, too, the use of forgings has reduced costs, cut finishing time and greatly reduced the number of rejects when compared to the sand castings that were formerly used.

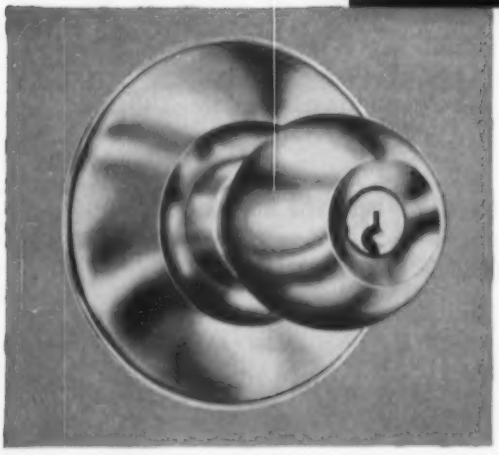
Whether you manufacture decorative hardware where finish is of prime importance or rugged assemblies that must stand up to bruising everyday punishment, it will pay you to investigate Mueller Brass Co. forgings. Strong, long wearing brass, bronze or aluminum parts, forged to your exact specifications under exacting statistical quality control standards can help you reduce costs, improve performance, and give you a better looking product. Write for our engineering manual (No. H-58565) . . . or call in one of our engineers to investigate possible forging applications in your products.



ASTRA design

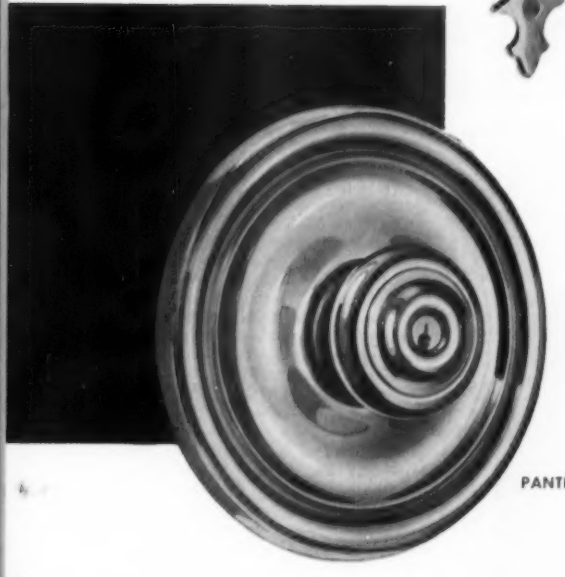


MONARCH design



MERCURY design

WAVERLY design



PANTHEON design

• WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED

Mueller Brass Co. Forgings
Engineering Manual H-58565 ☐

Tuf Stuf Aluminum Bronze Alloys
Engineering Manual H-58563 ☐

600 Series Bearing Alloys
Engineering Manual FM-3000 ☐

Copper Base Alloys in Rod Form
Engineering Manual FM-3010 ☐

METALS AND ALLOYS REVIEW

by FRANK M. LEVY
Vice-President and Director of Research

Last week one of our sales engineers was at the home office and we were talking about one of his customers in the East who manufactures milling machines which are being used for milling aircraft spars. We are supplying gibs, slide bars and wear strips to this company made of our "600" series bearing metal in rectangular rod form. The material formerly used was aluminum bronze* cast bars which they could only obtain in 36" lengths. Their engineering department estimates that costs have been reduced 50% on this component. Machining time has been reduced and impregnation of porous castings has been eliminated.

Our sales representative was curious about my experience with "600" in other applications such as this. Oddly enough, our own plant has been a pretty good proving ground. In our extrusion department, for example, we have gotten exceptionally good service from slides made of "600" and used on the die heads which are subject to pressure and extremely rough usage.

Bob Irwin of our forging department reports that the "600" strips he has used for lining the ways of our big forging presses have proved far superior to the bronzes which were original equipment. The bronze strips squashed out after protracted running. More important, the "600" strips last 10 times longer before replacement is necessary.

In our copper tube fabricating department we have a lot of automatic equipment for the production of formed tube shapes like tees and ells used in the plumbing industry. On one of the tube benders, there was no provision made for replacing worn forming slides. Our Maintenance Department reworked the machine using "600" strips as replaceable forming slide inserts. The bender is now a far more efficient machine. Because of the long life of "600", downtime on this machine has been practically eliminated.

While we were talking about these uses in our own plant, it brought to mind some other instances where the exceptionally good wearing properties of "600" have been established. A Cincinnati lathe manufacturer uses "600" in the form of counter sunk hexheaded screws on wearing strips used on lathe carriages. When the strip wears to the retaining screw the ways will not be scratched.

According to their own records, all other materials which they had tested proved unsatisfactory for the job. Another maker of precision lathes and milling machines found that after a year of exhaustive tests, the "600" metal that was used as nuts on compound slide screws outlasted competitive metals at an approximate ratio of 3 to 1 at an estimated saving of 30%.

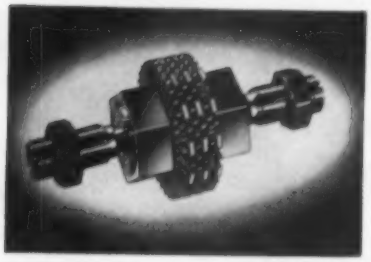
Sliding surfaces on all kinds of machinery have different wear characteristics, as you have undoubtedly found. If you have any problems involving gibs, slide bars or wear strips that are proving troublesome, why not drop me a line or send a part print and we'll be glad to study it and make the proper recommendations.

**We manufacture 4 grades of wrought aluminum bronze.*

MUELLER BRASS CO.

PORT HURON 23, MICHIGAN

185



Besly-Welles Dresser Cutters Are Interchangeable

Type A "Wise" dresser cutter assembly is offered in two types of cutting-wheel assemblies, interchangeable on the same arbor. Standard type has a cutter-blade assembly made up of six wheels with all fine teeth, and is reported suitable for dressing soft abrasive disks. Other type has three wheels with fine teeth and three wheels with alternate fine and broad teeth; it is recommended for dressing hard abrasive disks.

Assembly features an arbor of square design, which is said to eliminate chewing of the keyway holding cutter on the arbor spindle. Buttons pressed into the side of each cutting wheel eliminate need for spacing washers, and speed assembly and replacement. Each type of assembly retails at $9.05.

Besly-Welles Corp, South Beloit, Ill

Bonding tape called Varband reportedly has excellent dielectric qualities and high thermal stability with no distortion or elongation. Tape also resists mild acids, alkalis, oil, and grease. Composed of hundreds of parallel Fiberglas yarns coated and impregnated with special polyester resin, tape can be used for banding wires, armatures, and coils.

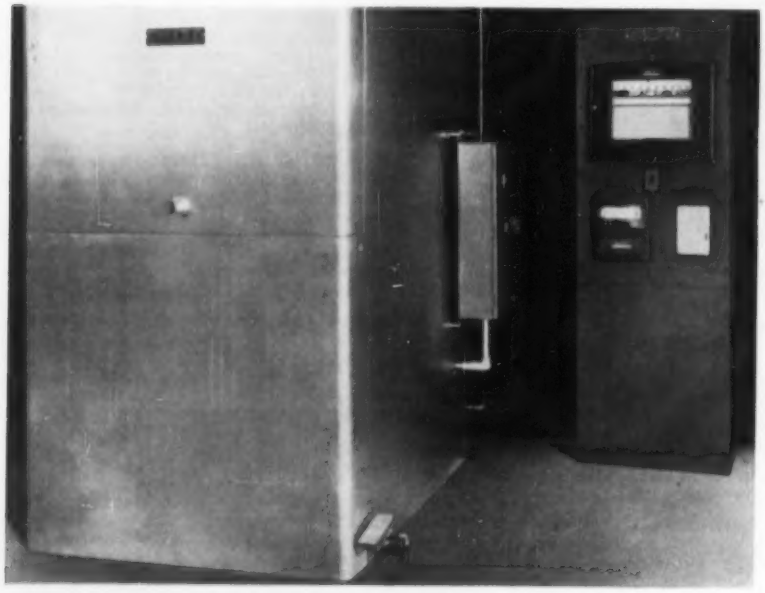
Varflex Corp, Rome, NY

Nylon webbing sling is designed to assure scratch-free handling of soft or highly finished material. Sling is chemically treated to resist grease, abrasion, alcohols, alkalis, salt water, and many solvents. Available in several widths and lifting capacities (largest is 3½ in. wide, will lift up to 13,500 lb), slings have a 5-to-1 safety factor.

Caldwell Co, Inc, 1123 Fourth Ave, Rockford, Ill

Dry-type welding flux, No. 6-20, is for use in applying Colmonoy nickel- and cobalt-base hard-facing alloys to hard-to-weld metals. Material is said to impart excellent flow characteristics, and contains no glare-producing salts. It is also reported suitable for use on cast-iron parts. Material is available packaged in 1-lb containers.

Wall Colmonoy Corp, 19345 John R St, Detroit 3, Mich



ELECTRIC FURNACES in AR Series are streamlined, with rounded corners and a minimum of projections. Doors are air-operated by foot valve. Elements are of 80/20 chrome-nickel ribbon of extra-large cross-section, formed in sinuous loops and slid into grooves in the refractory lining. Control panel is free standing and available in several combinations. Series includes 8 models, ranging from 15 to 51 kw—*Waltz Furnace Co, Dept 1, Symmes St, Cincinnati 6, Ohio*

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

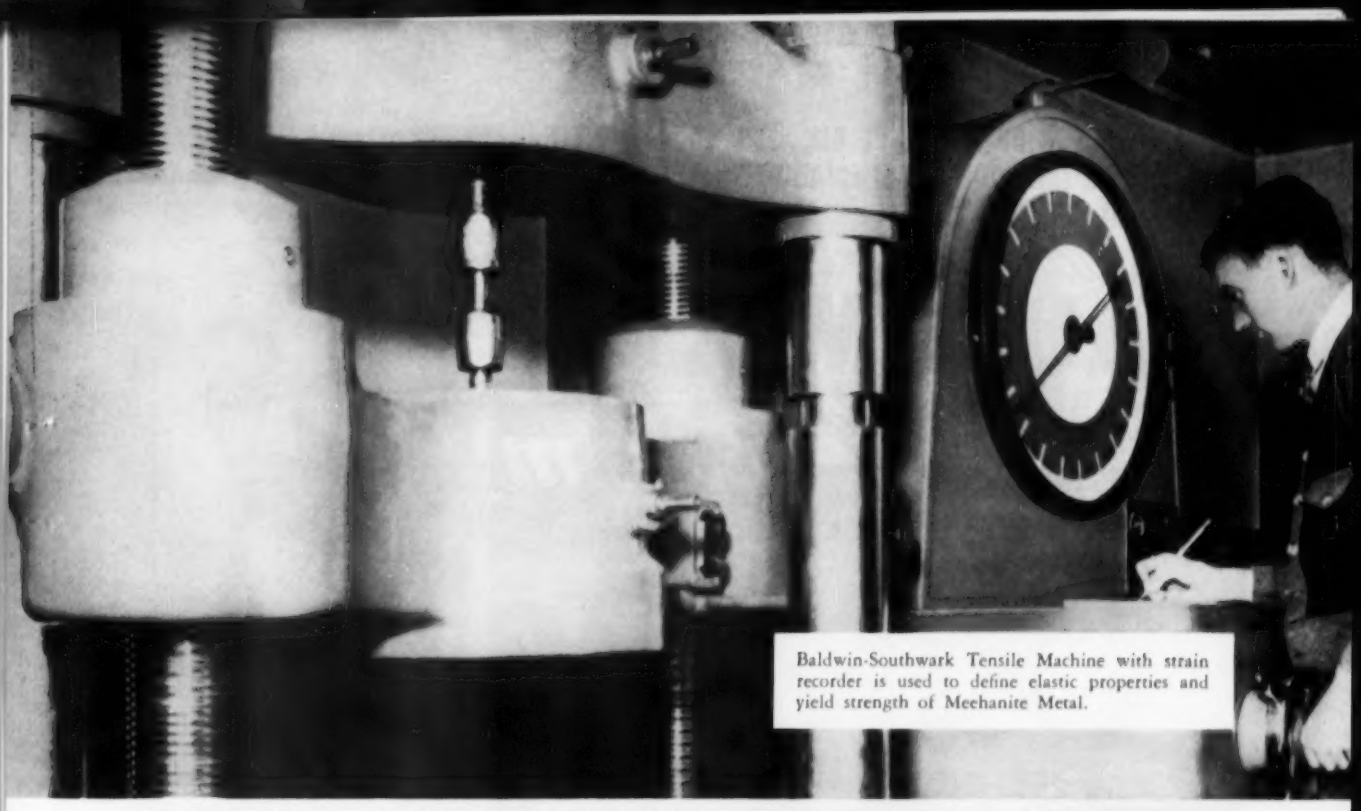
The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington and Dover, N. J.
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Blackmer Pump Co., Grand Rapids, Mich.
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
DeLaval Steam Turbine Co., Trenton, N. J.
Empire Pattern & Foundry Co., Tulsa, Okla.
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundry Co., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Mattison Machine Works, Rockford, Ill.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Industries, Inc., Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Valley Iron Works, Inc., St. Paul, Minn.
Vulcan Foundry Co., Oakland, Calif.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

SEND FOR BULLETIN TODAY

● **"MEEHANITE CASTINGS FOR PRESSURE TIGHTNESS" BULLETIN NO. 43**

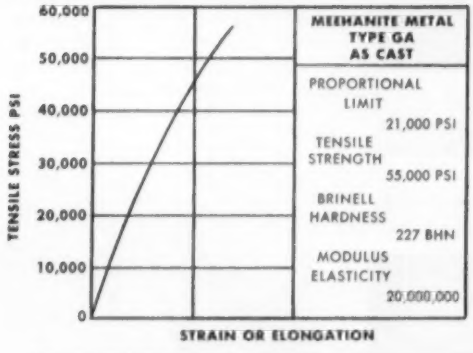
Write today to Meehanite Metal Corporation, Dept. 4D, 714 North Avenue, New Rochelle, N. Y.

MEEHANITE®



Baldwin-Southwark Tensile Machine with strain recorder is used to define elastic properties and yield strength of Meehanite Metal.

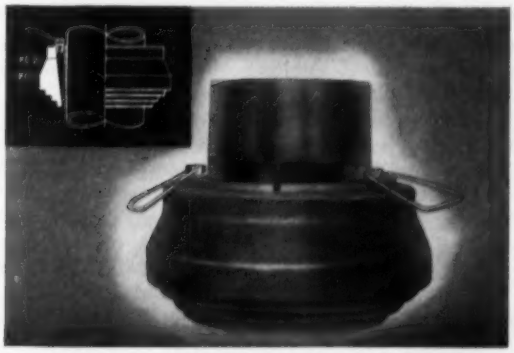
MEEHANITE CASTINGS POSSESS TRUE ELASTIC PROPERTIES AND ARE MADE TO RIGID ENGINEERING SPECIFICATIONS



Meehanite Metal has a controlled microstructure, consisting of uniformly distributed graphite in a fully pearlitic matrix, which is comparable to that of a normalized spring or tool steel. This structure, the result of a unique manufacturing process based upon proven metallurgical techniques, assures good tensile properties in association with high yield strength and elastic modulus. These properties are of paramount importance in the selection of engineering materials since they aid in defining the useful characteristics of Meehanite Metal in service.

For information, write today for Bulletin 43 — Meehanite Castings for Pressure Tightness.

Power-Twin hydraulic pullers of 17½, 30 and 50 ton capacities manufactured with Meehanite ram body castings tested to 24,000 psi. The 30-ton unit needed an applied load of 87 tons before failure.



Meehanite casting support (KC-1) to hold tapered slips (KC-2) is subjected to downward pressures of up to 150,000 lbs. in oil well drilling. No evidence of failure under loads up to 210,000 lbs.

MEEHANITE METAL®

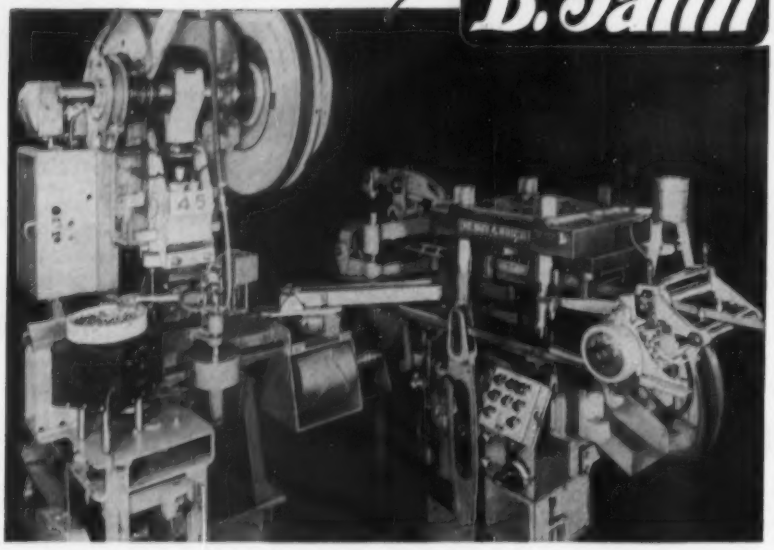
MEEHANITE METAL CORPORATION • NEW ROCHELLE • NEW YORK

2 PRESSES . . . 1 PROGRESSIVE DIE . . . 1 STIPPLING DIE . . . ENGINEERING INGENUITY . . . SPECIAL MACHINERY . . . SPECIAL ELECTRICAL COMPONENTS . . .

produce

AUTOMATION

by **B. Jahn**



Here's true automation — 100% automatic production, 100% B. Jahn built, that transforms .025" aluminum into precise meter components 3⅛" in diameter — each with 720 teeth .009" deep — without human hands, human error!

Equipped with B. Jahn progressive die, one 60 ton press was linked by a chain drive to a 45 ton press incorporating a stippling die.

Progressive die, ground all over to guarantee greater accuracy, longer service, less downtime, pierces and blanks intricate discs.

Conveyor system feeds disc into air-operated vacuum arm that positions piece in B. Jahn stippling die. Another arm removes stippled piece and places it on stacking unit.

Completed discs, at the rate of 30 per minute, are automatically stacked and spaced on spindle.

Here's true AUTOMATION, true production economy!

Get Full Details On This Astounding "No Hands . . . No Delay . . . No Error" Automation Application — Send Today for the Big New B. Jahn Brochure.

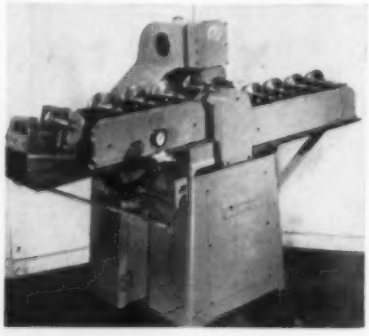
B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

INERT GAS ARC WELDER rated at 200 amp, 40 v, has current range of 10 to 300 amp, ac or dc. Selector switch permits choice of ac-dc straight or dc reverse welding current. Unit has magnetic contactor and removable rheostat for remote control — *Hobart Brothers Co, Hobart Square, Troy, Ohio*

Pipe-welding electrode, Fleetweld 5-P, is reported suitable for all E-6010 applications. Electrode has characteristcs of smooth arc operation, deep penetration, and good bead wash-in. Available in diameters of ⅛ and 5/32 in., electrode conforms to AWS requirements.

Lincoln Electric Co, Cleveland 17, Ohio



Schmidt Machine Marks Pinion Gears Automatically

Model 395 automatic marking machine is designed to imprint code numbers on pinion gears as they come off the production line. Unit is fed by a conveyor chain which carries pinions under the concave lettering tool, after which they are rolled to the discharge chain for ejection. Production rate is 900 per hour. Machine is driven by a 1-hp motor.

Geo T Schmidt, Inc, Dept AM, 4100 Ravenswood Ave, Chicago 13, Ill

X.F. Swiss Pattern 65-Gauge 3" Broach file—one of the smallest Nicholson-made files

18" Mill Bastard—one of the largest files made by Nicholson

From micro-mechanics to forgings . . . there's a Nicholson or Black Diamond file for every purpose

You may not finish miniature dies or components by hand in your plant. And you may not dress huge forgings. But there's a Nicholson or Black Diamond file that's exactly right for each of these uses—and for every file use in between.

Depending on the job at hand, you can select X.F. (EXtra Fine) Swiss Pattern files in hundreds of shapes and sizes . . . Special Purpose files for aluminum, brass, lead, stainless steel, and other metals and plastics . . . Machinists' files, Regular Purpose files and rasps . . . from more than *six thousand* consistently high-quality Nicholson and Black Diamond varieties.

Your Nicholson or Black Diamond catalog will show you the wide choice of files and rasps available. And you can learn a lot about file selection, care and use from "File Filosophy," an interesting, profusely illustrated book that's yours for the asking.

If you happen to have an unusual filing problem, your industrial distributor is likely to have the solution. He's an expert with a specialized knowledge of industrial equipment and processes. So call on him for professional advice as well as service.

Always specify Nicholson or Black Diamond brand

NICHOLSON U.S.A. **NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND** BLACK DIAMOND U.S.A.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILE COMPANY

A FILE FOR EVERY PURPOSE

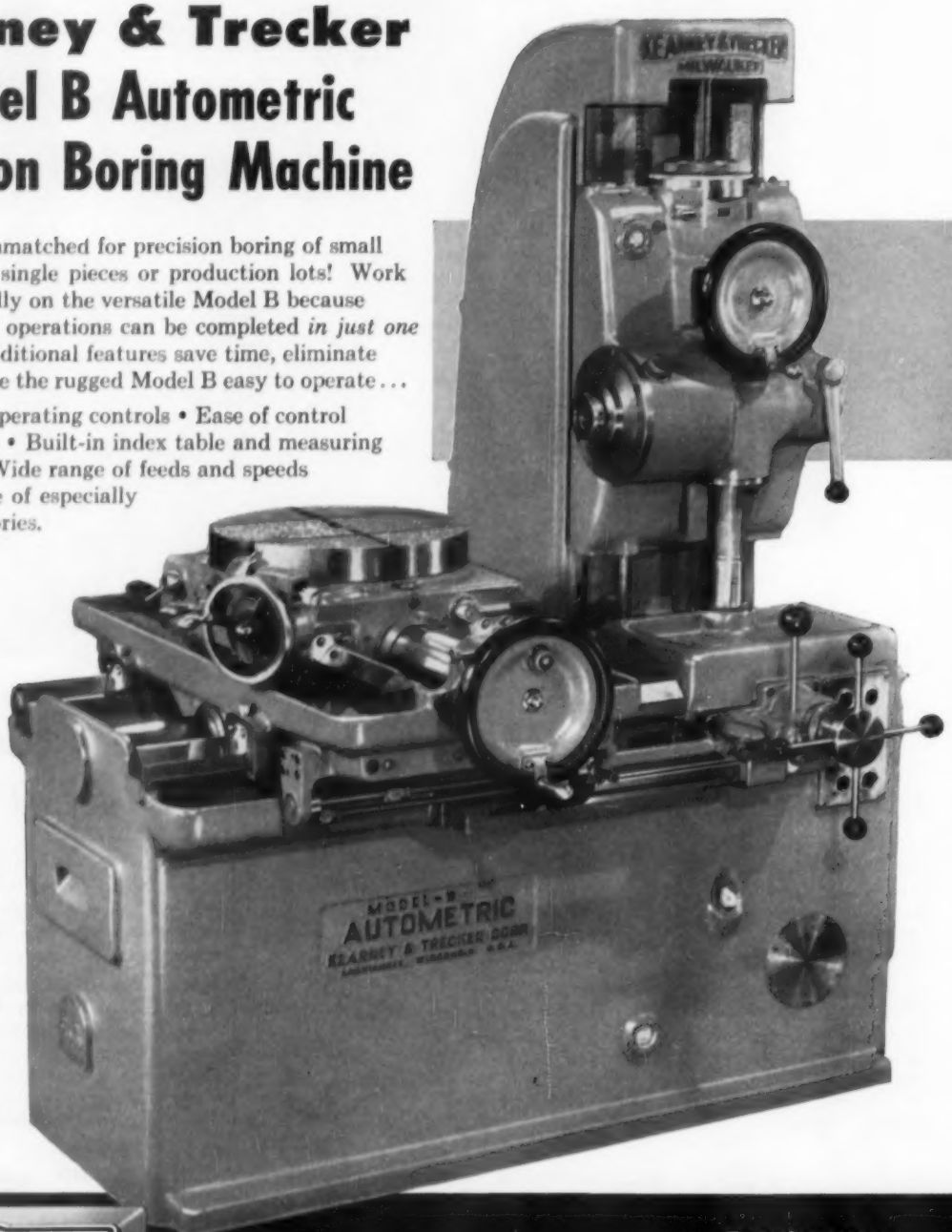
Speed Precision Boring

and maintain accuracy of .0002" in 12" with the

Kearney & Trecker Model B Autometric Precision Boring Machine

Here it is . . . unmatched for precision boring of small work . . . either single pieces or production lots! Work progresses rapidly on the versatile Model B because multiple boring operations can be completed *in just one setup.* These additional features save time, eliminate errors, and make the rugged Model B easy to operate . . .

Convenient operating controls • Ease of control • Ease of setup • Built-in index table and measuring instruments • Wide range of feeds and speeds • Complete line of especially selected accessories.



Model B Autometric: 16" dia. table; 10" Vert. Travel; 16" Transverse Travel; 15" Carriage Travel; 8 speed changes—.0005" to .0148" per Spindle rev.; 50 to 2500 rpm. For complete details, ask for Catalog No. BMA-10.

KEARNEY & TRECKER MILWAUKEE

Designers and Builders of Precision and Production Machine Tools Since 1898

ATLANTA, GA.
Scott Machine Tool Co.
411 Williams St., N.W.

BIRMINGHAM, ALA.
George M. Meriwether Industrial Equipment
1712 Seventh Ave. North

BOSTON, MASS.
Stedfast & Roulston, Inc.
11 Deerfield St.

BUFFALO 23, N.Y.
Syracuse Supply Co.
1965 Sheridan Drive

CHARLESTON, W. VA.
Wm. S. Bolden Co., Inc.
MacCorkle Ave.

CHATTANOOGA, TENN.
Scott Machine Tool Co.

CHICAGO, ILL.
Jackson-Fotsch Co.
7350 West Lawrence Ave.

CINCINNATI, O.
The E. A. Kinsey Co.
327-335 W. Fourth St.

NEW YORK, N. Y.
Kearney & Trecker Corp.
409 Grand Ave.
Englewood, New Jersey

NEW ORLEANS, LA.
Stauss & Haas, Inc.
524 Camp St.

OMAHA, NEB.
Fuchs Mach. & Supply Co.
2401 N. Eleventh St.

PHILADELPHIA, PENN.
Machinery Assoc., Inc.
325 E. Lancaster Ave.
Wynnewood, Penna.

PITTSBURGH, PENN.
Kearney & Trecker Corp.
4 West Manilla Ave.

PORTLAND, ORE.
Harry M. Euler Co.
2811 N.E. Gilsan St.

RICHMOND, VA.
Smith-Courtney Co.
Seventh & Bainbridge Sts.

For details, contact these

KEARNEY & TRECKER DISTRIBUTORS

or write to

KEARNEY & TRECKER CORP.
6786 W. National Ave., Milwaukee 14, Wis.

CLEVELAND, O.
Kearney & Trecker Corp.
Euclid Ave. & E. 17th St.

COLUMBUS, O.
The E. A. Kinsey Co.
1020 W. Fifth St.

DALLAS, TEX.
Greene Machinery Co.
6300 Wyche Blvd.

DAYTON, O.
The E.A. Kinsey Co.
16 Washington St.

DENVER, COLO.
F. J. Leonard Co.
1219 California St.

DETROIT, MICH.
Kearney & Trecker Corp.
10600 Puritan Ave.

GREENSBORO, N. C.
Smith-Courtney Co.
239 S. Davie St.

HICKORY, N. C.
Smith-Courtney Co.
103 3rd Street, S.W.

HOUSTON, TEX.
Steel & Machine Tool Sales
6414 Navigation Blvd.

INDIANAPOLIS, IND.
The E. A. Kinsey Co.
1550 Stadium Drive

KANSAS CITY, MO.
Blackman & Nuetzel Machinery Co.
1103 E. Armour Blvd.

LOS ANGELES, CALIF.
Moore Machinery Co.
3200 S. Garfield Ave.

MILWAUKEE, WIS.
Kearney & Trecker Corp.
6784 W. National Ave.

ROCHESTER 4, N. Y.
Syracuse Supply Co.
311 Alexander Street

ST. LOUIS, MO.
Blackman & Nuetzel Machinery Co.
3713 Washington Ave.

ST. PAUL, MINN.
Sales Serv. Mach. Tool Co.
2363 University Ave.

SALT LAKE CITY, UTAH
Todd Machinery Co.
4165 Holloway Drive

SAN FRANCISCO, CAL.
Moore Machinery Co.
7th & Carleton-Berkeley

SAN JOSE, CALIF.
Moore Machinery Co.
656 Stockton Ave.

SEATTLE, WASH.
Dawson Mach. Co.
5700 First Ave., S.

SHREVEPORT, LA.
Peerless Supply Co., Inc.
701 Spring St.

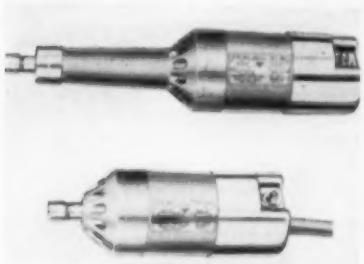
SYRACUSE 1, N. Y.
Syracuse Supply Co.
314-332 W. Fayette St.

TULSA, OKLA.
White Star Mach. Co.
104 Boulder Bldg.
19 West 10th Street

WICHITA, KAN.
White Star Mach. Co.
301 N. St. Francis

CANADA
MONTREAL
OTTAWA
QUEBEC
TORONTO
WINDSOR
Williams & Wilson Ltd.

NEW SHOP EQUIPMENT



New Die Grinders Are Suitable For High-Speed Burs, Points

Four new models of No. 320 hand die grinders for toolroom and die-shop requirements are furnished in two styles: long nose, with over-all length of 11¼ in., and snubby nose, 7¼ in.; each is available in speeds of 20,000 or 30,000 rpm. Units, also adaptable for many applications using special jigs and fixtures, are cool-running and vibrationless.

Chucking capacity on all four is ⅛ to ¼ in. Precision collet chucks allow burs and mounted points to be held close to the bearing. Each grinder comes in a case containing one ⅛-in. arbor, one each ⅛ and ¼-in. collet chucks, one ⅜ x ⅜ x ⅛-in. grinding wheel, two chuck wrenches, and 10 ft of cord.

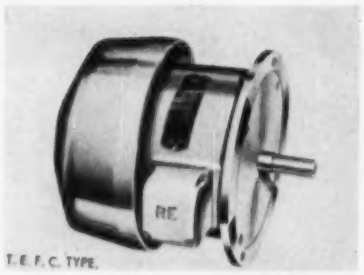
Millers Falls Co, Greenfield, Mass

Lightweight Clamping System Has Capacity From 0 to 12 in.

Clamp-All Parallels for holding operations on all types of machines weigh 14 lb, are available in matched pairs with max opening of 65 in.

System consists of a Meehanite parallel bar and six attachments: D jaw for vertical holding of rounds or shapes; E jaws for horizontal clamping of rounds or shapes; B clamp which fulcrums on lower hinge and is held in place with a hardened ground pin; back-up jaw C; A hold-down clamps designed with spring loaded feature so that when tightening on screw, clamps push in and down, eliminating pounding or hammering work into flat position.

Jerico, 4744 W Lake St., Chicago 44, Ill



Machine Tool Precision Motors Feature Vibrationless Running

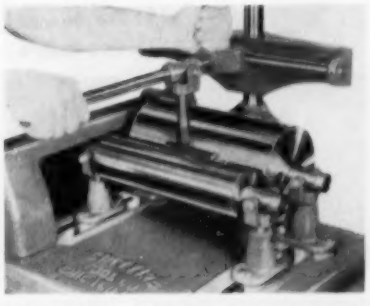
Motors built for powering machine tools have dynamically balanced rotor installed between two extra-heavy-duty ball bearings. Precise tolerances are similarly maintained thoughout assembly.

Radial air gap design units use a thinner, lightweight, low-inertia rotor for smooth starts and quick stops. Narrower rotor also shortens motor's over-all length to give a wafer effect. Units are available in TEFC and TENV types in ratings from ½ through 3 hp, continuous or intermittent duty.

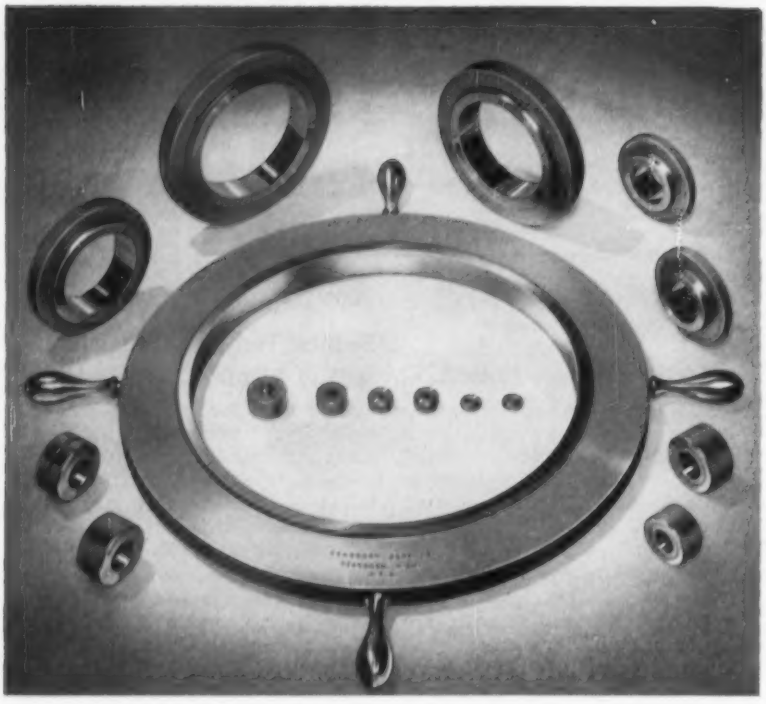
Reuland Electric Co, Alhambra, Calif

Solder fluxes designed primarily for use on copper and copper-base alloys are non-corrosive and quick wetting. Known as H Series, fluxes utilize safe-to-handle derivatives of the chemical hydrazine. During soldering operation flux decomposes and vaporizes, leaving essentially no residue. Material is said to be stable, can be stored in closed containers for long periods without loss of fluxing activity.

Federated Metals Div, American Smelting & Refining Co, 120 Broadway, New York 5, NY



VERSA-GRIP OVERARM ATTACHMENT for Spitfire roller lapping machines enables operator to use less effort to apply greater pressure on piece parts during lapping operation. Ball bearing construction simplifies horizontal and vertical movement—*Spitfire Tool Co, 2931 N Pulaski Rd, Chicago 41, Ill*



For Finer Accuracy, Higher Quality, Lower Gaging Costs!

DEARBORN MASTER SETTING RINGS MASTER SETTING DISCS

When it comes to controlling internal and external work dimensions, you'll find it pays to set your production and inspection gaging equipment with Dearborn Master Rings and Discs. Produced to A.G.D. Standards, they are made of the finest quality steel . . . stabilized, ground, and precision lapped to specified size. All are subjected to rigid, 100% inspection under closely controlled laboratory conditions to assure the ultimate in uniformity and accuracy. And they are available with either steel or chromium plated gaging surfaces in a wide range of sizes to meet your particular requirements . . . Master Rings from .029" to and including 12.260", Master Discs from .150" to and including 8.510".

IF YOU BUY GAGES, Dearborn's 48-page illustrated catalog is designed to save you time. It's available to Inspection, Production, and Purchasing executives . . . send for it today!

DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Look to **DEARBORN** for the finest in quality controlled gages!

NEW SHOP EQUIPMENT

Universal-Joint Drilling-Head

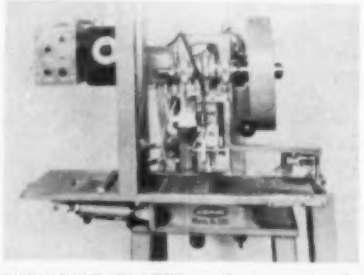
All heads on adjustable Model 2 are equipped with No. 2 MT sockets. Over-all length is 20 in.; guide bars are bushed for 1 or 1¼-in. pins on 17½-in. centers. Diameter of lower clamping ring is 15-7/8 in.; minimum centers, 1⅝ in.; maximum diameter pattern, 9¾ in. Approximate weight is from 60 to 75 lb, depending on number of spindles. Case, cover frame, and locator arm casting are aluminum.

All spindles are hardened and ground with gears turned on spindles. Drive gear has heavy-duty grooved ball thrust bearings on top and bottom of gear, and heavy-duty roller bearings top and bottom.

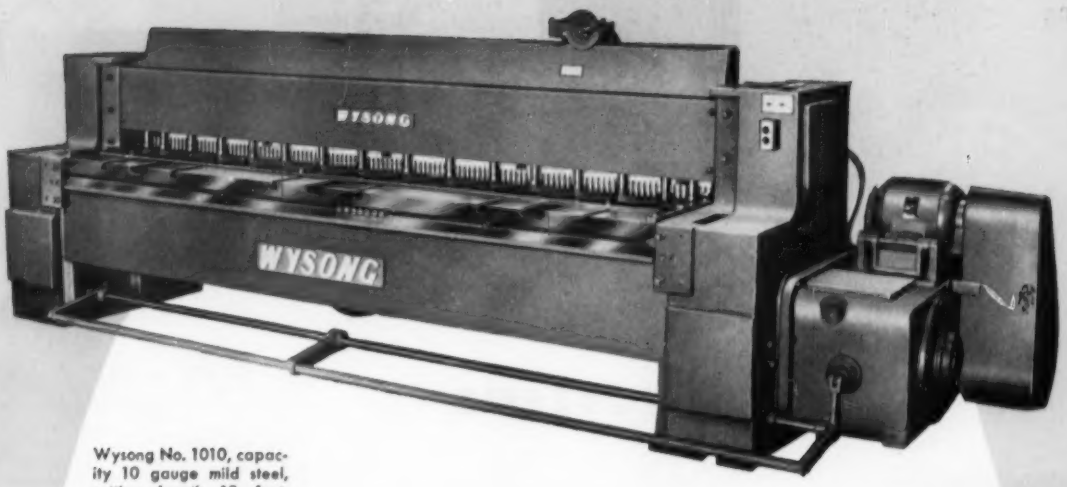
Errington Mechanical Laboratory, Inc, Staten Island 4, NY

Rubber vibration-dampening pads, known as Cohrlastic Shock Stops, come in 18 x 18-in. molded sheets. Waffle design gives effective support, and air trapped within waffle cups provides additional dampening effect. Made of neoprene rubber, pads are not affected by fuels and oils. Each pad costs $10.

Connecticut Hard Rubber Co, 407 East St, New Haven 9, Conn



PHENOLIC PLATES with copper circuits are marked in color with circuit identification or assembly numbers by Acromark Model 9AS hot stamping press. Speed is 3600 per hr; unit has preset counter for any number up to 1000—*Acromark Co, 7-13 Morrell St, Elizabeth, NJ*



Wysong No. 1010, capacity 10 gauge mild steel, cutting length 10 feet.

Greater Accuracy! Greater Production! Less Maintenance Costs!

Hi-tensile casting construction gives the necessary weight and mass to Wysong squaring shears. With a tensile strength of 35,000 to 40,000 P.S.I. hi-tensile casting construction can resist the shock and pounding a shear must take. The heavily ribbed table, knife-bar and end frames resist sag or deflection and *maintain accurate alignment*. Because hi-tensile castings absorb vibrations, Wysong shears run quieter and smoother.

Standard features of Wysong shears include:

- Automatic, compensating holddown. Each foot under individual tension. Compensates for varying thicknesses in metal and permits simultaneous shearing of different thicknesses.
- Ball bearing precision back gauge. Adjusts to .0078 (1/128th) inches.
- Time proven, trouble free, 9-jaw clutch with built in non-repeat unit.
- Straddle mounted gears, run in oil.
- Metal finger guard, mounted on holddown. Does not obstruct view of cutting line.

Wysong shears can be equipped with power operated back gauge, a light gauge, remote control switch, automatic lubrication, extension gauges, and rubber pads for holddown feet. Rake of top blade can be changed for cutting plastics, composition sheets and special metals.

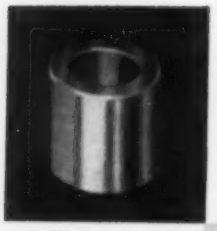
Wysong also builds air power and foot operated squaring shears and bending rolls. See your dealer or write to factory for full information.

Buy a Wysong... It's miles ahead.

NATIONAL MACHINE TOOL BUILDERS ASSN. MEMBER

WYSONG

Wysong and Miles Company
Greensboro, N. C.



THE

simplest answer

TO BEARING PROBLEMS

Bunting capability and leadership in the field of Cast Bronze Bearings and parts are well established and widely recognized. Today Bunting offers an equally comprehensive and responsible service in the field of Sintered Powdered Metal Bearings and parts.

Bunting's special knowledge and facilities make Sintered Powdered Metal products available in many applications not heretofore considered feasible. We can help you find the simplest answer to your individual problem, be it Cast Bronze or Sintered Metal.

A wide range of stock sizes of Bunting Cast Bronze and Sintered Powdered Bronze self-lubricating, plain and flange bearings, thrust bearings and bars are available from Bunting distributors everywhere in America.

Write for catalogs.

Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

Stanley Finishing Tool Has 450 Separate Blades

Hand tool called Surform, developed for forming and finishing all types of surfaces, is available in two models—one shaped and used like a hand plane, the other like a rasp. Cutting component is a Sheffield unit having more than 450 blades. Each cutting edge has a 35° angle and a semi-circular throat through which chips and shavings pass, so that each blade functions in effect as a miniature block plane.

Applications include trimming up castings and moldings and finishing non-ferrous metals. Cutting strip is easily replaced.

Stanley Works, Tool Div, New Britain, Conn

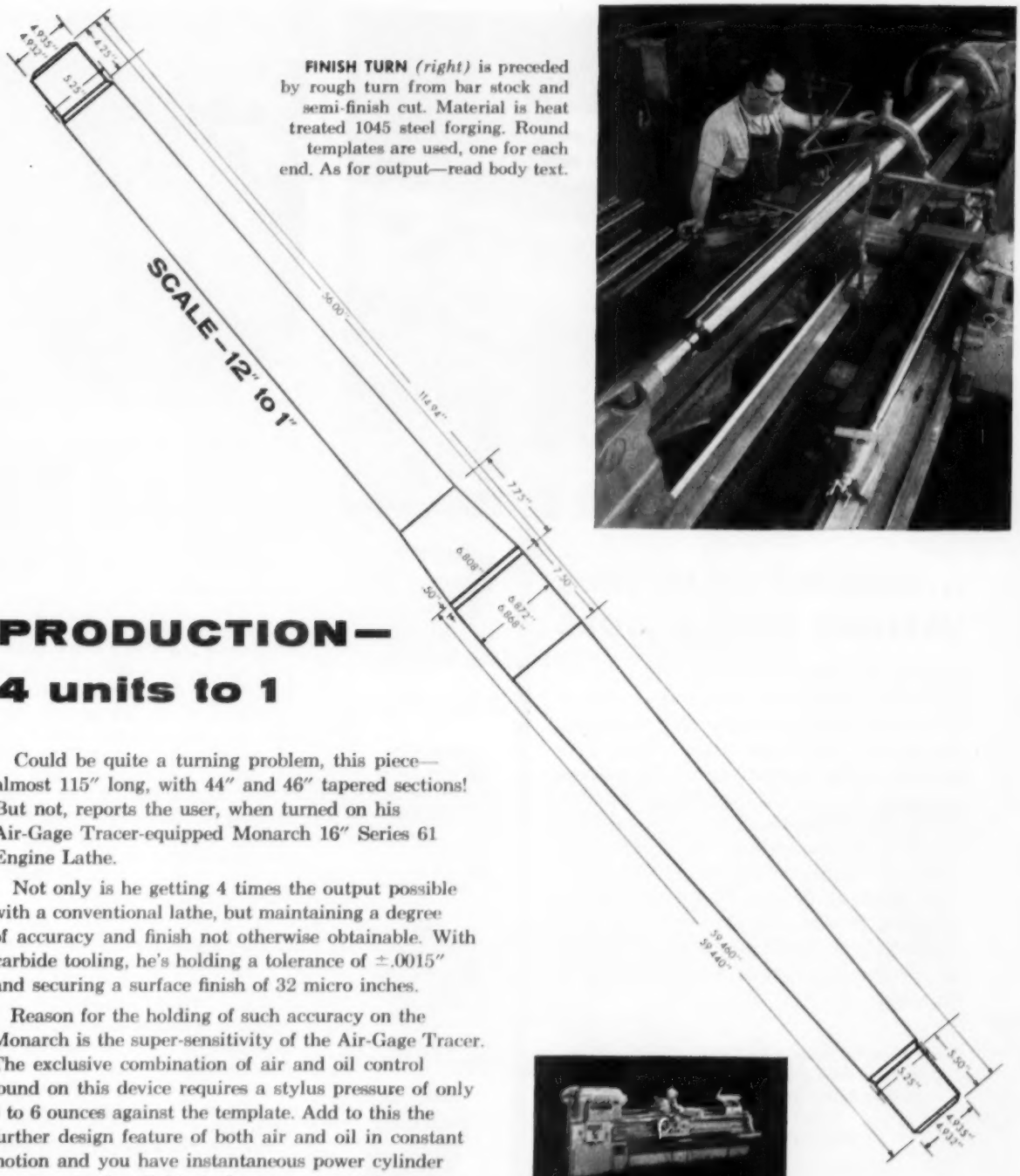
Oxyacetylene welding rods of extruded, bronze-coated design are designed for braze welding and welding malleable iron, cast iron, brass, and bronze with dirty or greasy surfaces. Three types of rods are available in four sizes and lengths. Coating reportedly cannot be knocked off in normal use.

Air Reduction Sales Co, Div of Air Reduction Co, 150 E 42nd St, New York 17, NY

Pneumatic controller, Series 500, is offered for measuring and controlling such variables as pressure, vacuum, temperature, liquid level, flow, differential pressure, and mechanical motion. Control modes available include narrow band, proportional, reset, derivative, and reset plus derivative. Cascade, selective, and ratio-control models are also offered as well as program control models. Bulletin A130.

Bristol Co, Waterbury 20, Conn

FINISH TURN *(right)* is preceded by rough turn from bar stock and semi-finish cut. Material is heat treated 1045 steel forging. Round templates are used, one for each end. As for output—read body text.



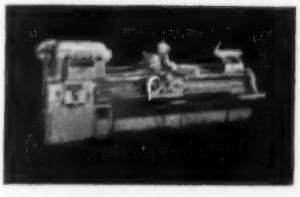
PRODUCTION— 4 units to 1

Could be quite a turning problem, this piece—almost 115″ long, with 44″ and 46″ tapered sections! But not, reports the user, when turned on his Air-Gage Tracer-equipped Monarch 16″ Series 61 Engine Lathe.

Not only is he getting 4 times the output possible with a conventional lathe, but maintaining a degree of accuracy and finish not otherwise obtainable. With carbide tooling, he's holding a tolerance of ±.0015″ and securing a surface finish of 32 micro inches.

Reason for the holding of such accuracy on the Monarch is the super-sensitivity of the Air-Gage Tracer. The exclusive combination of air and oil control found on this device requires a stylus pressure of only 5 to 6 ounces against the template. Add to this the further design feature of both air and oil in constant motion and you have instantaneous power cylinder response to the slightest change in template shape.

Now—about your turning requirements! We've got the machines and the tracer controls to better almost any conventional setup. Why not bet a three cent stamp against almost unlimited production improvement? Let us prove it . . . ***The Monarch Machine Tool Company, Sidney, Ohio.***



Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

YOUR PRODUCTION

FUTURE

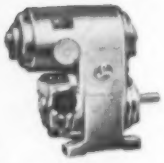
IS BUILT INTO...

...STERLING SPEED-TROL VARIABLE SPEED MOTORS

Sterling Speed-Trol Variable Speed Motors are fundamental to the success of any manufacturing operation involving changing production conditions. Speed-Trols give machinery the versatility which assures optimum productivity regardless of manufacturing variables. They also prevent obsolescence of machinery due to changes in processes or production volume. As insurance against future or unanticipated changes, it will pay you to investigate Sterling Speed-Trol Variable Speed Motors. They have your production future built into them.

Write today for Bulletin No. 188. Discover the big advantages Sterling Speed-Trol Variable Speed Motors can bring to your plant.

Sterling offers you a wide range of Electric Power Drives of advanced design—variable speed or constant speed—with manual or automatic controls.



STERLING SPEED-TROL VARIABLE SPEED MOTORS

STERLING SLO-SPEED GEAR MOTORS

STERLING CONSTANT NORMAL SPEED MOTORS

STERLING MULTI-MOUNT SPEED REDUCERS

STERLING ELECTRIC MOTORS

Los Angeles 22 • Chicago 35 • Cincinnati 37 • New York 51

Sm

NEW SHOP EQUIPMENT

AUTOMATIC CALCULATING DEVICE (German), called the Controller, is an aluminum 1-oz (including case) unit capable of determining same calculations as a 10-in. slide-rule. Price, *$7.95—Distributed by Controller-Calculators, Silver Bells, Ltd, 600 16th St, Oakland, Calif*

Boring bars, designed for through-hole boring and boring to a shoulder, have toolbits positioned 30° from the shoulder being bored, so that they cut ahead of the boring bar. Bars are made in diameters from ⅜ to 1½ in., of heat-treated alloy steel. Toolbits are mechanically clamped into bars; triangular HSS or solid-carbide bits can be furnished from stock. Built-in positive side rake is constant throughout length of bit.

Everede Tool Co, Dept 107, 2000 N Parkside Ave, Chicago 39, Ill

Flexible plastic pipe said to have extremely smooth bore is packaged in long coiled lengths and in several diameters. Virgin polyethylene used is highly resistant to acids, alkalis, and other corrosive chemicals, and is not subject to electrolytic corrosion, rot, or bacterial attack. Pipe may be used at temperatures from –50 to 125 F.

American Hard Rubber Co, 93 Worth St, New York 13, NY

End mills for aluminum and its alloys are available in 23 sizes and styles, with right-hand cut and right-hand spiral flutes. For rapid disposal while plunge-cutting, they are made with higher spiral flutes than conventional cutters. Mills also have full end teeth to permit grinding various radii. Flute and faces are polished to facilitate chip flow; shanks are flatted for setscrew.

Goddard & Goddard Co, Detroit 23, Mich

AUTO MAKERS are making tremendous strides in weeding out obsolescence from their 40,000 drilling machines and 26,000 lathes.* They well recognize that over half their machines were built to World War II standards. In fact, over half the entire country's production is limping along with machine tools that are over 10 years old. This is no news to our enemies . . . nor to your alert competition. Yet modernization is quick and inexpensive with "Standard Machine Tools" developed against fresh, new concepts of appearance, function and accuracy. To this end, Cincinnati Lathes and Drills are built to do much of your jobbing, tooling, maintenance and light production work at tremendous savings. Write for complete catalog information. Cincinnati Lathe & Tool Company, 3247 Disney, Cincinnati 9, Ohio.

*Figures from American Machinist's Seventh Inventory.

center on... **cincinnati lathes and drills**

Machines shown are Cincinnati's new 21" Sliding Head Drill and 15" Tray-Top Lathe.

Use MANHATTAN ABRASIVE WHEELS for Faster Cutting and Grinding . . .

Whatever your needs, a Manhattan Abrasive Wheel can be engineered for your particular alloy requirements. Manhattan Abrasive Wheel Specialists help solve problems at *your* plant, for faster cutting, rough grinding or finishing. Every component of the wheel they specify—abrasive, grain size, hardness, structure and bond—is custom-designed for your working conditions to remove *more* metal, *faster* . . . at *lower* cost.

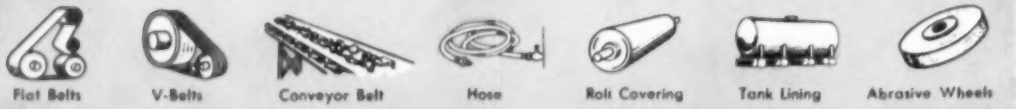
ROUGHING WHEELS • FINISHING WHEELS
CUT-OFF WHEELS • MOLDISCS • DIAMOND WHEELS for

Foundry Snagging—Billet Surfacing
Centerless Grinding
General purpose grinding with portables
Grinding and Finishing stainless steel welds
Bearing Race Grinding and Finishing
Finishing Tools and Cutlery
Cutting-off—Wet or Dry—Bars, Tubing, Structurals, etc.
Foundry Cutting—standard and reinforced wheels
Grinding Carbide Tipped Tools

Discuss your metal removal requirements with a Manhattan Abrasive Wheel Specialist. He'll show you how you can get more output per man hour . . . "More Use per Dollar".

WRITE TO ABRASIVE WHEEL DEPARTMENT
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

G E Small Tachometer Generators Offered in AC and DC Versions

Small-diameter tachometer generators for such applications as speed measuring and regulation are offered in both ac and dc models. Designed for incorporation into variable-speed drive systems, totally enclosed units are of ball-bearing construction. Protected terminals are located in an easily accessible conduit box. Models have a diameter of 3-5/16 in.

Four-pole ac tachometer, serving a speed range of 400 to 5000 rpm, can be used for speed indication on all types of machine tools, and where speed indication of moderate accuracy is required. Unit has a voltage output of 28 v per 1000 rpm, ±10%. Only 6 in. long and weighing less than 4 lb, unit is available in seamless steel shell-type construction with base- or end-flange mountings.

The dc tachometer generator features low shaft inertia (1.4 lb-in.^{2}) and 1.5% ripple. Designed for high-accuracy speed indication and feedback regulation, unit can be used with all types of machine tools. Units are said to supply enough power to operate one instrument and one recorder. Models are available for both 50 and 100 v per rpm. Stainless-steel covered, unit is 7.47 in. long and weighs about 6.5 lb. It will measure rotational speeds from 100 to 5000 rpm and linear speeds which can be measured in terms of rpm.

General Electric Co, Schenectady 5, NY

Way wiper, which can be installed on most machine tools, provides positive protection wherever metal parts slide over ways in close alignment. Device is made in four types, all incorporating synthetic-rubber wiping member. All are 22 in. long, and are easily cut to required length. Screw holes for attachment to sliding member of machine tool are provided.

Chicago Rawhide Mfg Co, 1267 Elston Ave, Chicago 22, Ill

Port-contour cutter in carbide-tipped model is designed for cutting standard internal O-ring boss for straight-thread tube fittings developed by company. Tool has four flutes which form the complete contour as tool is fed into drilled hole. Bushing-type pilots can be replaced or resized by changing the bushing. Cutter is available in 13 diameters for all sizes of fittings used with ⅛-in. through 2-in.-dia tubing.

Sonnet Tool & Mfg Co, 578 N Prairie Ave, Hawthorne, Calif

Now DRILL PRECISION HOLES IN 1 PASS ON YOUR DRILL PRESS OR LATHE

with Sealol's

DRILL ADAPTOR

Whether you drill deep or shallow . . . your present drilling equipment is quickly and economically adapted for **precision gun drilling** with Sealol's Drill Adaptor —

Gun Drilling produces **straight** holes with feeds greater than 11 ipm — tolerances held to less than .0005 in. — wall finishes smoother than 8-10 rms . . . **all in one operation!**

Here's How It Works: The Drill Adaptor is designed for direct attachment to vertical or horizontal drilling equipment. It is installed (or removed) in a few minutes.

The Drill Adaptor transfers coolants at rotational speeds to 10,000 rpm . . . at pressures to 1,000 psi.

Regardless of the depth of hole, coolant is delivered right at the cutting edge. Drills always run cool, chips are continuously flushed out.

Actual Production Records Prove

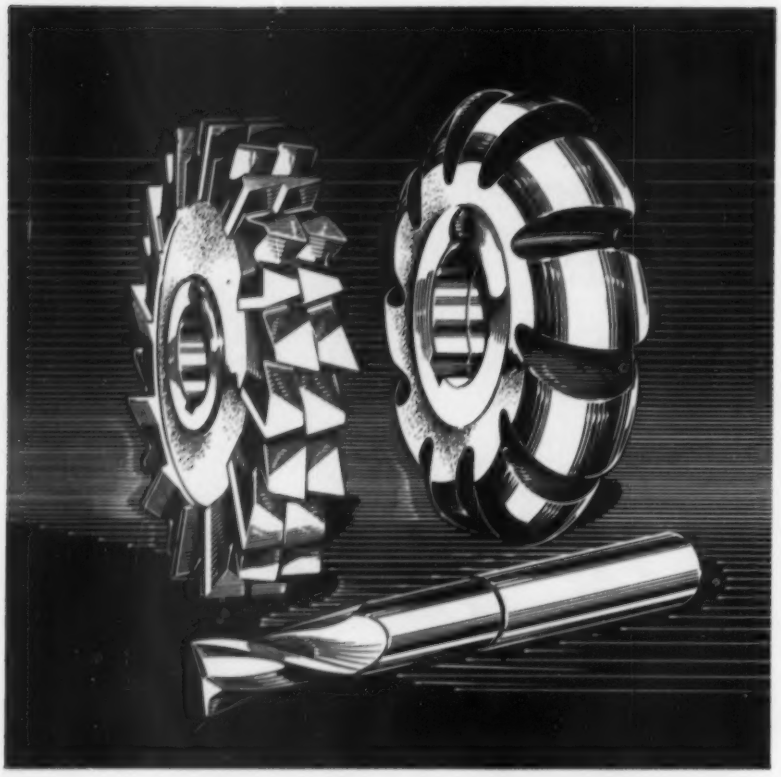
- You save money.
- You get longer tool life, fewer rejects, greater output.

Find Out More about Sealol's Drill Adaptor . . . how easy it is to install, how it can improve drilling performance in your shop. Send for Bulletin No. 12.

SEALOL

Mail This Coupon Now

DEPT. H, WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.
Please send me Bulletin No. 12 on Sealol's DRILL ADAPTORS for use in precision gun drilling.
Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....



Are solid high-speed steel milling cutters obsolete?

If they are someone ought to tell our customers about it. They've asked us to produce so many styles and sizes that we finally went all the way and stock the most complete line available anywhere.

No, the solid high-speed steel cutters haven't been obsoleted by the carbides. When it comes to the smaller production runs and toolroom use, the solid steel cutters are *it*. Here, they'll perform more than adequately at the lowest possible initial tool cost. And they're much easier to maintain than the more costly carbide cutters.

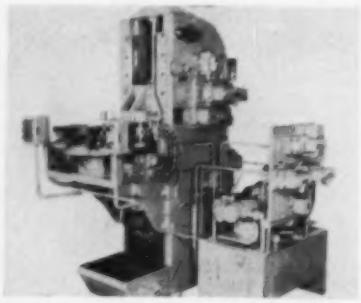
Even though Go & Go produces a lot of inserted blade cutters, we're just as proud of our extensive line of solid high-speed steel cutters. Every tool is engineered with the same care and over 38 years of milling cutter know-how goes into each and every one.

Want to see the extensive stock of standards available? Ask for Catalog F, it's free on request. Go & Go also designs and manufactures special milling cutters in quantity. Check one of our engineering sales representatives in principal industrial centers for details.

Go & Go

GODDARD & GODDARD COMPANY
DETROIT 23, MICHIGAN
Engineering and producing tools that Go & Go since 1917.

NEW SHOP EQUIPMENT



BUSHINGS are assembled into cover parts and burnished in a continuous operation on Model T-6-24, a 6-ton, 24-in.-stroke vertical push-down broaching machine. Unit has a 6.0-sec cycle, can produce 400 complete parts per hour based on 100% efficiency— *American Broach & Machine Co, Ann Arbor, Mich*

GE 1000-w Mercury Lamp

Model G-E H1000 RC 15 has an interior phosphor reflector which directs two-thirds of its light downward, one-third up.

Lamp is 15-1/16 in. long, has a mogul base, is rated at 53,000 lumens, operates at 265 v; price, $56.

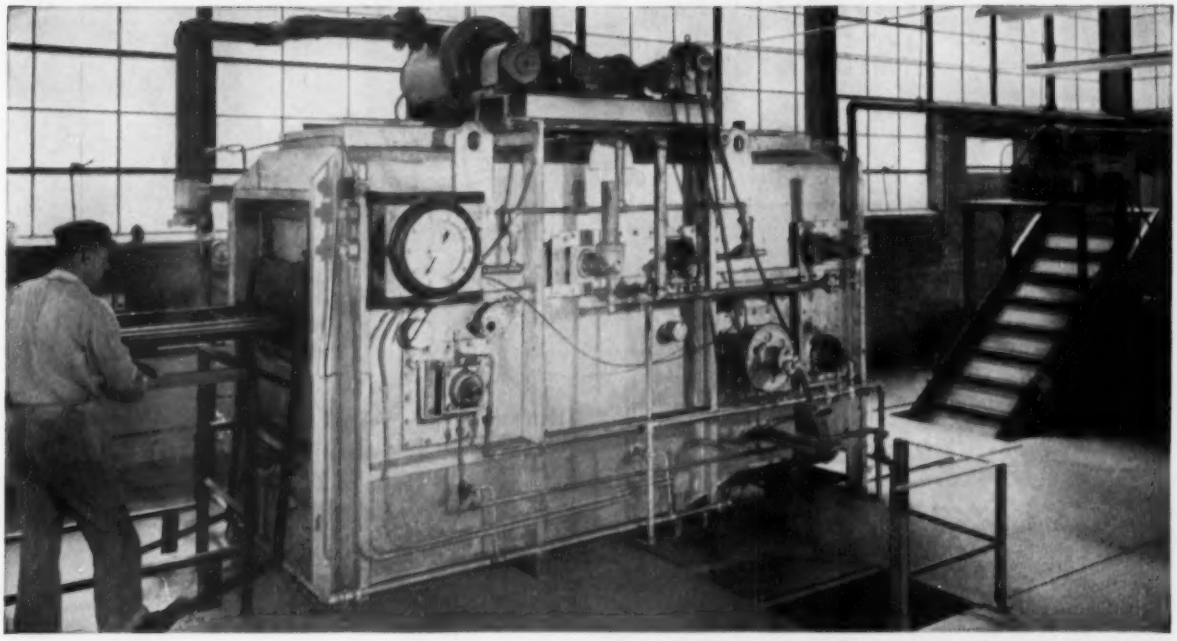
General Electric Co, Lamp Div, Nela Park, Cleveland 12, Ohio

Pyrometer temperature controllers of 3-position design can be used with such machines as plastic extruders, industrial ovens, and furnaces. They provide for two types of neutral band, each with two types of control. One band, with single-setting pointer, permits no more than 1% of scale range as neutral; the other, with two settings, permits spread up to 20% of range. On-off or proportioning-type control is offered. All models are free from vacuum tubes. Bulletin JT-1.

West Instrument Corp, Chicago, Ill

Modification kits for G E magnetic starters, offered in six models, are built for across-the-line, non-reversing, combination, or reversing starters. Modification can be made in minutes with a screwdriver. Standard magnetic starter can be modified to fit any of six special conditions by installing pushbutton or selector switch in starter cover, changing fuse clips on disconnect switch, changing the coil, adding a third overload relay, or adding an auxiliary interlock kit. Modifications are for starters in open or in NEMA Type 1 enclosures and for NEMA Sizes 0 through 4.

General Electric Co, Schenectady 5, NY



Surface Standard Chain Belt furnace in a Chicago heat treat plant.

Gain both continuous production and the savings of standard design

You can have the labor savings, product uniformity, and high production of continuous operations sooner than you may have guessed. Standardized design by Surface® makes three types of continuous furnaces economically possible for many users who couldn't consider custom installations.

1. Standard continuous belt furnace (shown above), with gas-fired radiant tubes and enclosed quench chute; used for many controlled atmosphere processes.

2. New Snap Hearth furnace—first of its type with radiant tube heating—for continuous controlled atmosphere processing of small parts.

3. Continuous brazing furnace, which puts joining operations on a high production basis, eliminates costly welding, machining.

Engineering costs are spread over many units, standard parts are in stock, delivery is comparatively quick. Furnace performance and operating costs are predicted before you buy. You'll get continuous satisfaction from these Surface furnaces.

GET NEW INFORMATION: SURFACE COMBUSTION CORPORATION, 2385 DORR ST., TOLEDO 1, OHIO

☐ Send me new information on Surface Standard continuous furnaces.
☐ Send me new information on the entire line of Surface Standard equipment.

Name _____ Title _____

Company _____

Company address _____

Surface®
HEAT TREATING EQUIPMENT

ACCO products

Wilson "Tukon" Micro Hardness Testers

UNEXCELLED for testing fine parts... METALLIC and NON-METALLIC

Model LR
Floor model for Micro and Macro Hardness Testing.

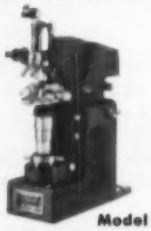
WILSON "TUKON" Micro Hardness Testers meet every fine test requirement. These precision instruments are invaluable in the proper testing of fine precision parts, fine wire, thin metal, shallow superficially hardened surfaces, jewels, plastics, glass, etc. WILSON "TUKON" testers operate with both Knoop and 136 degree Diamond Pyramid Indenters.

Model FB
Floor model for Micro Hardness Testing only. (Electrically operated)

Consult with WILSON Engineers on your hardness testing problem

Experienced WILSON Engineers will be glad to help you select the proper model for your particular requirement. This choice depends on the type and thickness of work to be tested, range of loads and other hardness testing equipment available.

Write for Booklet **DH-328** *on WILSON "TUKON" Micro Hardness Testers. Ask for* **DH-325** *on WILSON "ROCKWELL" Hardness Testers.*



Model MO
Table model for Micro Hardness Testing only. (Mechanically operated. Also available in floor model)

WILSON "ROCKWELL"...
the world's standard of hardness accuracy

ACCO

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

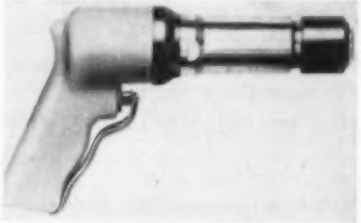
for Better Value

NEW SHOP EQUIPMENT

HALF-MOON RETAINING RINGS are gaged for thickness and parallelism on Precisionaire gage, which checks part in three places and permits size classifications in 0.0001-in. increments. Unit consists of feeding and gaging fixture and a 3-column gage. Operator loads rings onto vertical stacking tube and by means of push-pull feed mechanism slides rings individually into the gage station. Three Plunjet gaging cartridges, each connected to its own air column in the gage, do the checking—*Sheffield Corp, Dayton 1, Ohio*

LP-gas conversion assembly for industrial trucks is so designed that any mechanic reportedly can handle the job without prior training or special tools. Each assembly includes Beam 120 regulator, vacuum safety switch, hydrostatic relief valve, solenoid valve, filter, quick coupling, correct-size Beam LP-gas carburetor or carburetor adapter, and all hoses with attached fittings. Step-by-step instructions for the 20 operations necessary for conversion are furnished.

Beam Products Mfg Co, 3040 Roselyn St, Los Angeles 65, Calif



HEAVY-DUTY AIR HAMMER, Model AD 500, has bigger hammer and piston, delivers 2200 blows per minute at less than 80 psi, weighs under 4 lb. Safety chuck locks tools in six different positions—*Superior Pneumatic & Manufacturing Co, 4758 Warner Rd, Cleveland, Ohio*

Lapointe Machine Tool Company, Hudson, Massachusetts

FIRST OF ITS KIND IN THE WORLD!

...And It's Lubricated by Cities Service Pacemaker 400 T Oil!

LAPOINTE MACHINE TOOL COMPANY, originator of the broaching method of cutting metal over 50 years ago, has now originated the first vertical broaching machine with variable speed electro-mechanical drive.

Purpose of the huge, gear-driven machine is to increase tool life up to 500% through smoother operation, thus saving down time and producing more accurate work.

Selection of a lubricant for the new machine was of special importance because of the tremendous pressures it develops: normally 30,000 pounds, sometimes up to 60,000 pounds. Of the many brands of lubricants Lapointe tested, Cities Service Pacemaker 400 T had the necessary requirements for the job . . . so naturally, this superior lubricant got the job.

"We test the machines with Pacemaker 400 T at the factory and then put it in again when the broaches are assembled at the buyer's plant," says Lapointe. "It offers all the characteristics we need: Good film strength, high viscosity index, and exceptional anti-foam and anti-oxidant qualities. Needless to say, we're pleased and impressed with this Cities Service lubricant."

Like scores of others, Lapointe has discovered the search for a proper lubricant ends at the Cities Service label. Altogether, there are hundreds of Cities Service products for the exacting needs of industry. For more information, talk with your nearby Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

Quick Facts About New Broaching Machine

USES: Now used for broaching aircraft engine turbine buckets, but can be adapted to general broaching.

ADVANTAGES: Increases tool life 400-500% through smoother operation, less down time. Produces more accurate work. Variable cutting speed: 12 to 75 FPM. Available in single or double ram models with 72" to 100" stroke.

Quick Facts About Pacemaker 400 T Oil

USES: Propulsion turbine units where oil is circulated under heavy pressure. Widely used in naval and commercial vessels, high speed industrial machinery.

ADVANTAGES: High viscosity index, excellent heat resistance and film strength. Chemically fortified against oxidation, rust, and foaming.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

WHEELOCK, LOVEJOY & COMPANY, INC.
1250 Marquette Street, Cleveland Ohio

WHEELOCK, LOVEJOY & COMPANY, INC.
1855 So. Kilbourn Avenue, Chicago Illinois

WHEELOCK, LOVEJOY & COMPANY, INC.
265 Pennsylvania Avenue, Hillside New Jersey

WHEELOCK, LOVEJOY & COMPANY, INC.
12989 Greeley Avenue, Detroit Michigan

7 WAREHOUSES AT YOUR SERVICE

You'll get quick action on your order for alloy steel bars, billets or forgings . . . no matter what size, shape or heat treatment you require . . . when you call any one of our seven warehouses.

All seven are conveniently located in principal industrial areas. Each is staffed by expert metallurgists, and is well-stocked to give you speedy service.

Fill your current needs by ordering our own HY-TEN steels, the "standard steels of tomorrow", or standard AISI or SAE grades.

Or write today to our Cambridge office for your *free* Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

In Canada: Sanderson - Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.
144 Milton Street, Buffalo New York

WHEELOCK, LOVEJOY & COMPANY, INC.
4524 W. Mitchell Avenue, Cincinnati Ohio

HOME OFFICE:
WHEELOCK, LOVEJOY & COMPANY, INC.
137 Sidney Street, Cambridge 39 Massachusetts

NEW SHOP EQUIPMENT

Hammond Dust Collector Offered in Portable Model

Square portable dust collector, known as Model 40 DusKolector, uses a ½-hp motor and is mounted on casters. Cabinet size is 25 x 22 x 28 in. Model has a capacity, with two inlets, of 700 cfm and can be used with two 16 x 2-in. grinding wheels or two 4-in.-wide abrasive belts.

Shaft with hand knob provides convenient means of "shaking" filters for cleaning without removing them from cabinet. Front panel is easily removed for access to the replaceable glass fiber filters and dustpan.

Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich

MICROMETER line has been restyled; improvements include wear-resistant non-glare satin chrome-finish on sleeve and thimble; non-slip black wrinkle finish on frame; double hardened spindle—*J T Slocomb Co, Glastonbury, Conn*

Plastic tote tray molded of glass fiber and polyester resin weighs 7 lb, is said to be comparable in strength to steel containers weighing 27 lb. Flexibility absorbs shock, and rounded ends permit pans to travel easily on conveyor-line turns. Each pan is molded with slotted carrying handles.

Firestone Tire & Rubber Co, Akron, Ohio

Welding curtain trademarked Herculite is a combination of special vinyl and nylon. Only 1/3 the weight of cotton duck, curtain is flameproof, does not absorb shop oils and greases. Available in green, yellow, or red, curtain offers caution-zone partition and localizes welding splash.

Herculite Protective Fabrics, Dept W, 144 Little St, Belleville 9, NJ

Emulsion cleaner No. 333 can be used for cleaning and degreasing metal parts, fabrics, painted surfaces and the like. A liquid, cleaner is not a soap, and contains no acids or alkalis. Sample gallon costs $4.50.

Western Reserve Laboratories, 1438 St Clair Ave, Cleveland, Ohio

NEW SHOP EQUIPMENT

Level control for plating baths, called Eltemp, is constructed either of Uscolite or of a combination of Uscolite and Teflon. Utilizing their chemical-resistant properties and stability at high temperatures, device has a 36-in. fill tube which adds water as needed at the bottom of the tank, maintaining solution level within a tolerance of ±⅜ in. Tanks must be at least three feet deep for proper operation.

Elkhart Controls Co, Rte 2, Elkhart, Ind

Vest-pocket tachometer called the Sirometer transforms the inherent vibrations of revolving machinery into rpm's. Device is placed on the housing of a running motor; turning a disk emits an indicator wire, and when wire reaches the resonance point, the rpm can be read on upper scale and cycles per second on the lower scale. Direct reading from 800 to 25,000 rpm, tachometer comes in plastic container and is priced at $6.95.

Precision Instrument Service, 301 Franklin Ave, Franklin Square, NY

O-ring fittings, available in a variety of types and pipe sizes, are designed for leakproof, threadless connection of steel or copper tubing in air, refrigerant, and hydraulic systems. Threaded half is fitted to end of one tube, other half (including nut, O-ring, and split tapered ring) to another tube end. When halves are screwed together, O-ring and tapered ring provide seal and friction grip, which increases in effect as pressure increases.

Lenz Co, Box 1044, Dayton 1, Ohio

Solid film lubricant called Lubri-Bond A is offered in spray can, has resin base. Material operates in a temperature range of –300 to 500 F, and is recommended for parts operating at high speed and high loads. Lubricant air dries in 30 min. Price is $3.50 per 12-oz can.

Electrofilm, Inc, PO Box 106, North Hollywood, Calif

Extracto stud remover will extract studs or back them out partially. Small nose diameter facilitates use in close quarters on aircraft and other compact engines. Drivers are available in three sizes: No. 1 for stud sizes No. 10, ¼, and 5/16 in.; No. 2 for 5/16, ⅜, and 7/16 in.; No. 3 for 7/16, ½, 9/16, and ⅝ in.

Titan Tool Co, Main St, Fairview (Erie County), Penna

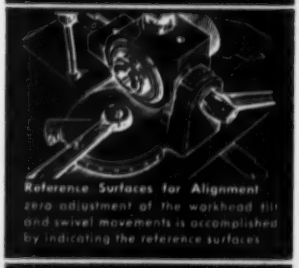
Only Cutter Grinder in the WORLD with all these features

END MILL CENTRA·POINT GRINDER

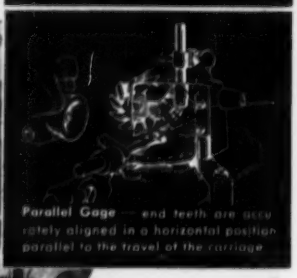
Specifically designed for sharpening the small cutters that are so difficult to grind on large machines, CENTRA-POINT is fully described in Bulletin M-55.

Clearance Angle Scale — clearance angles are read directly from a graduated scale on wheel spindle assembly

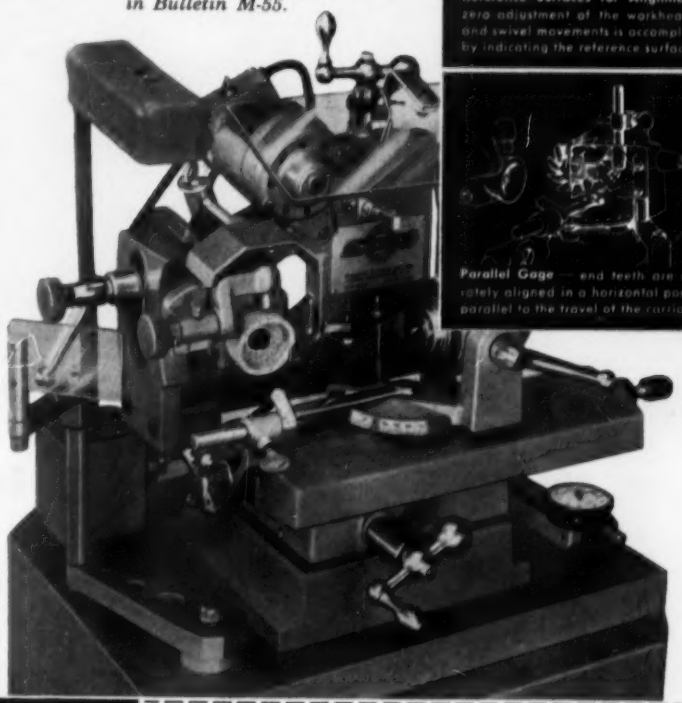
Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel, in correct relationship to self-registering tooth rests



Reference Surfaces for Alignment — zero adjustment of the workhead tilt and swivel movements is accomplished by indicating the reference surfaces



Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage



CENTRA-POINT DIVISION

William H. Field Co., Inc., 326 Dorchester Ave., Boston 27, Mass.

Please send a copy of the new CENTRA-POINT Data Sheet.

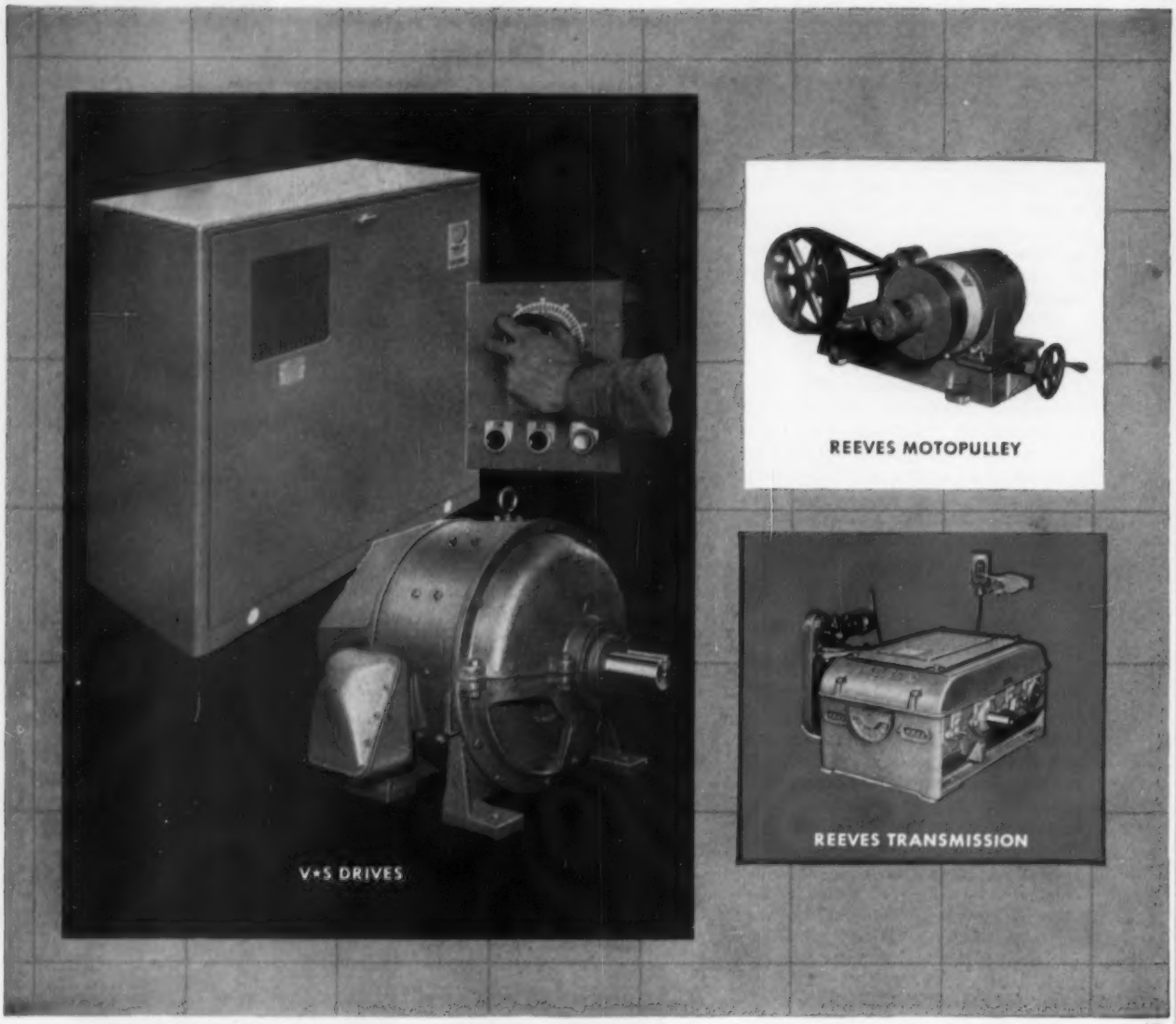
Name *Title*

(Please Print)

Company

Address

City *Zone* *State*



WIDENING THE HORIZONS OF

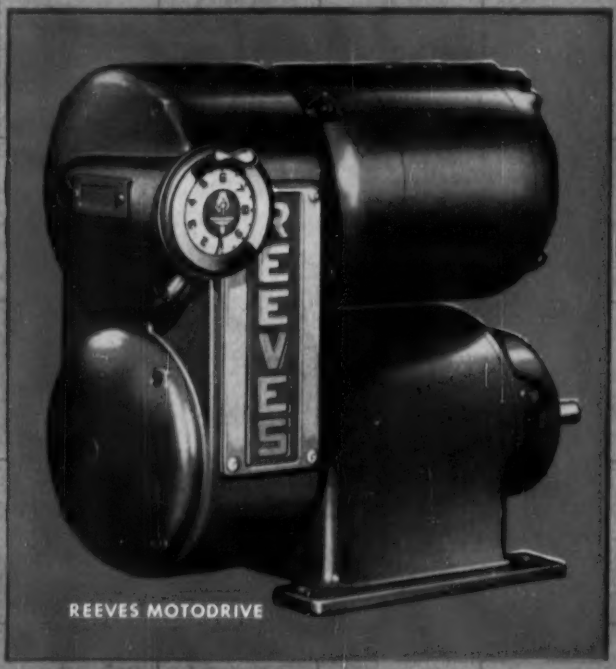
Automation is the key to greater production of more goods and services at lower cost. The Tools of Automation can be applied profitably in a countless number of individual industries.

Reliance can provide *you* with valuable engineering assistance which can help secure the advantages of automation.

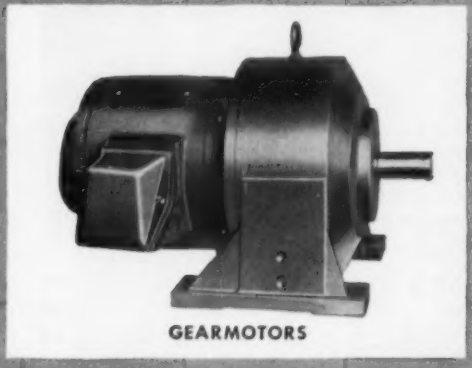
Our Tools of Automation consist of electric motors, variable-speed drives and controls.

RELIANCE

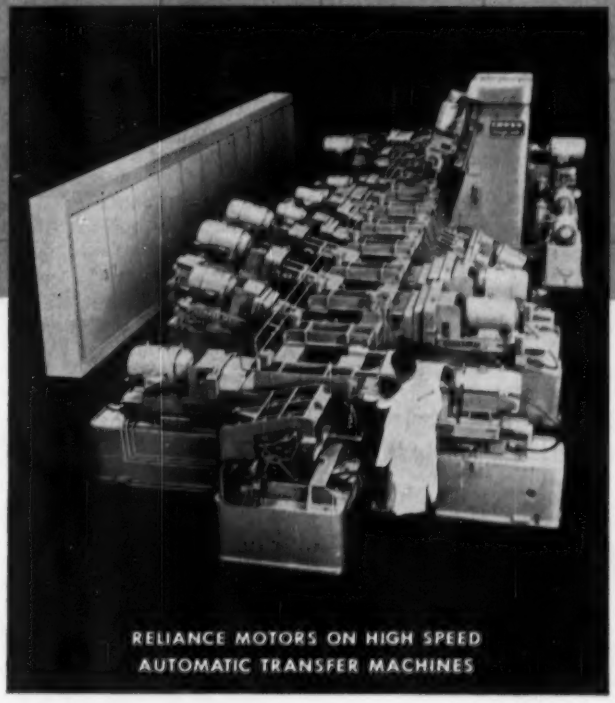
TOTALLY-PROTECTED MOTORS



REEVES MOTODRIVE



GEARMOTORS



RELIANCE MOTORS ON HIGH SPEED AUTOMATIC TRANSFER MACHINES

AUTOMATION

Application of these tools ranges from a single motor to multi-motor drives for highly complex production lines, where materials are processed into finished products in one continuous operation.

The world's largest manufacturer devoted exclusively to the production of quality motors and drives is ready to help you widen the horizons of automation in your plant.

Bulletin No. A-1555-B gives further details.

A-1519

ELECTRIC AND ENGINEERING CO.

DEPT. 111A, CLEVELAND 10, OHIO

Canadian Division: Welland, Ontario • Reeves Division: Columbus, Indiana

Sales Offices and Distributors in Principal Cities

When product designs for welded steel

Have twice the rigidity... three times the strength

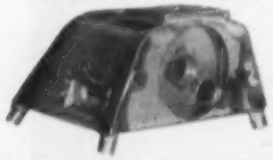
Yet require less material ...cost less to fabricate

WHY

aren't all your products designed for welding?

THE WELDED WAY

20% more rigid ...costs 44% less



Welded from 16 gauge sheet this power headstock weighs 28% less than cast iron design. Photo courtesy Oster Manufacturing Company, Cleveland, Ohio. Let Lincoln show you how to duplicate these advantages in your products.

Write

THE LINCOLN ELECTRIC COMPANY

Dept. 2016 • Cleveland 17, Ohio

Creating Lower Cost for Industry... With Welded Steel

ROUND TABLE *Discussion*

CAUGHT IN A BOX

Is a man right in refusing a promotion to a job that has spelled failure to three former holders of it? Or should he take on the job with the determination that he'll beat the jinx?

The man who turned down the promotion to foreman should have told his boss the real reason why he wouldn't take the higher job. What he did tell him was that he was happy in his present job as group leader and didn't want a lot of extra grief as foreman. What he should have pointed out was the fact that the short and unhappy lives as foremen led by the three previous incumbents of the position over a period of five years was fairly indicative of the inherent danger of accepting so precarious a promotion.

It would have been the better part of valor for the worker "caught in a box" of an undesirable promotion to have told the boss what was probably apparent to everyone else: that the real factors making the promotion unpalatable should have been adjusted a long time ago for the company's good. Here was a department that had had three foremen in five years, and not one of them could raise production due to the mismanagement and troublemaking proclivities of the departmental supervisor. This wrong-doing was common knowledge in the department but no one could, or would, do anything about it. The average employee knew from bitter experience that criticizing or talking about the shortcomings of his supervisor was usually the shortest distance between a paycheck and unemployment compensation. Everyone knew that getting up enough nerve to tell off the boss also meant losing a job.

In my opinion, Hadley did the smart thing in steering away from the bum deal of the doubtful promotion. It's to his everlasting credit that he declined the odious distinction of being a "yes" foreman. He would be working for a supervisor who was a notorious troublemaker and wouldn't let a subordinate do anything that would have made a difference to improve production. It would have been a galling and unfortunate experience. Just as coopera-

how to trap dust *that damages your machines and hurts company morale*

Priced from $190.00

easy-to-move TORIT DUST COLLECTORS *trap dust at its source!*

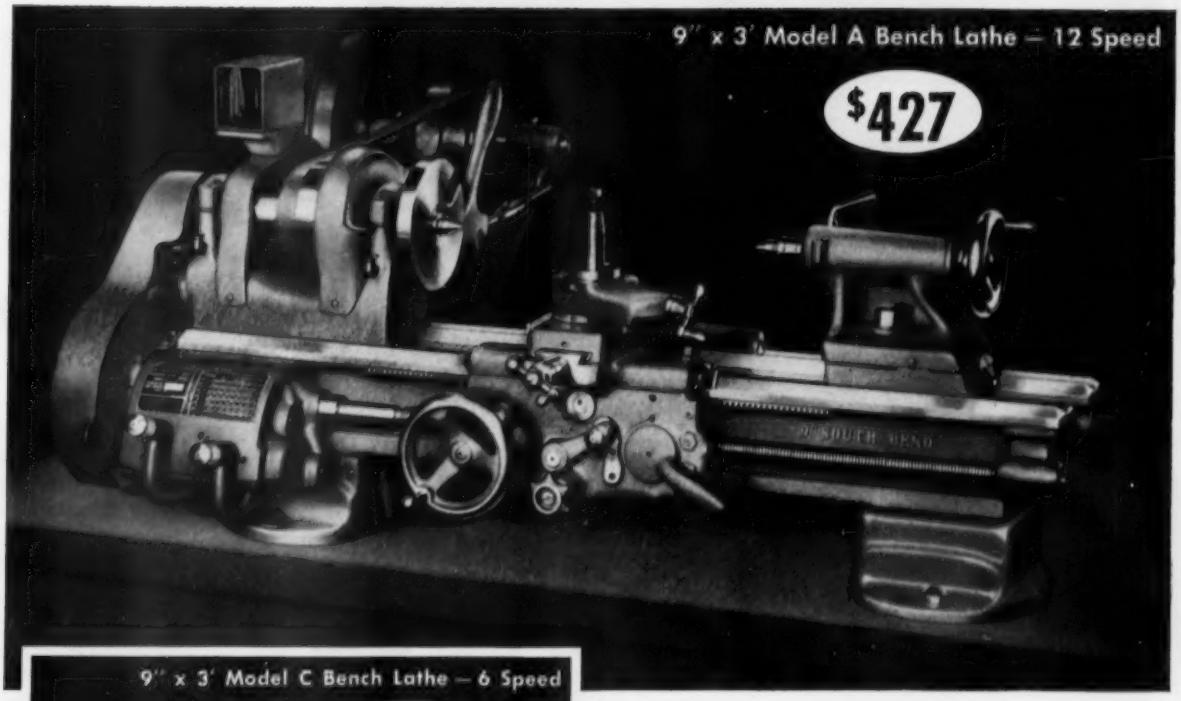
Untrapped dust costs you money, "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-the-building) system. Torit unit operates only when machine or combination of machines it protects are in use. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to...

TORIT MANUFACTURING COMPANY

Sweet's

Dept. 406
311 Walnut Street
St. Paul 2, Minn.

HERE'S MORE FOR YOUR MONEY



South Bend 9" Lathes represent far greater value than their moderate prices indicate. They are exceedingly accurate, quickly adaptable to a wide variety of work and built to give long, dependable service. These quality features can be offered because of the production economies resulting from volume manufacturing.

We sincerely believe that they represent more actual dollar-for-dollar value than any other lathe made. Evidence of this lies in the fact that they have out-sold all others. You'll be surprised at the many places these lathes can be efficiently worked into your production plans. Now is the time to have our distributor give you complete information.

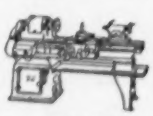
NEW CATALOG

Describes 9" to 16-24" Lathes, ½" and 1" collet Turret Lathes, 14" Drill Presses, 7" Bench Shapers, Milling Machines and Pedestal Grinders. Ask for Catalog 5600.

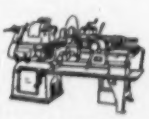
(Prices shown are f.o.b. factory, less electrical equipment.)

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES


☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES


☐ ½" & 1" Collet TURRET LATHES

☐ TOOL GRINDERS

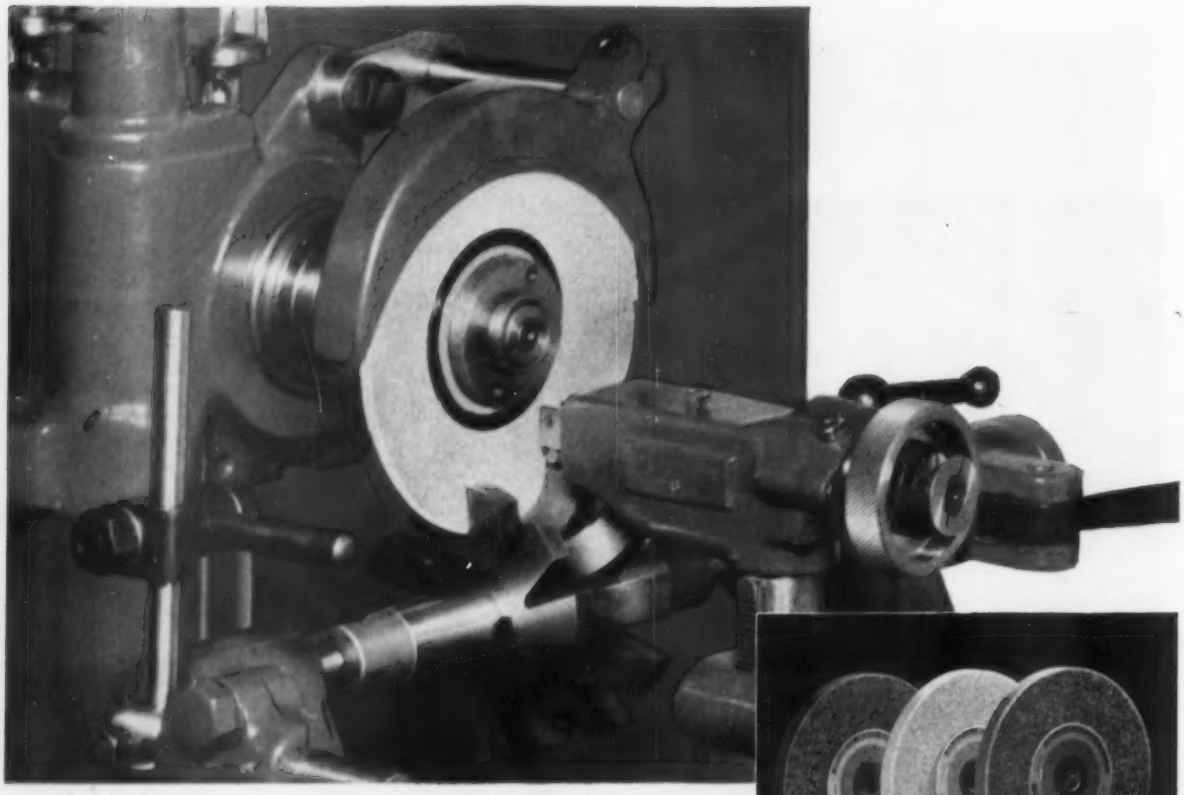
☐ 7" BENCH SHAPERS

☐ MILLING MACHINES

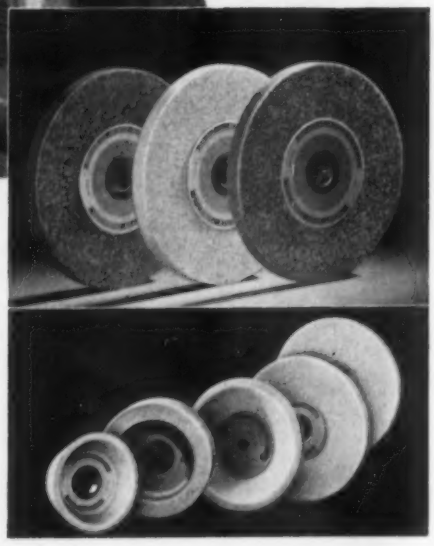
Name _____ Street _____

City _____ State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Sharpening formed cutter with Macklin V-6 Wheel



You can spark *your* production on every tool room grinding job with Macklin "Wheels of Profit". They stay sharp longer, cut faster and cooler. These precision performers include:

V-6 Wheels . . .
used principally to grind alloy steels of high tensile strength.

V-5 Wheels . . .
(silicon carbide). The popular choice to *economically* grind non-metallic, non-ferrous, and other materials of low tensile strength.

VMM Wheels . . .
(aluminous oxide or silicon carbide). The revolutionary new type wheel rated tops for precision grinding and finer finish.

FOR PROOF OF PERFORMANCE . . . READ THIS!

Operation . . . Surface grinding ends of carbide inserts in automotive plant.

		Here are the figures:	***WHEEL LIFE***
Production	**Wheel Cost**	Macklin 1" Wheel . .	60 hours
—Up 187%	—Down 50%	Competitors 1½" Wheel	32 hours

Macklin wheel was faster cutting, required no dressing, and user states, "It was possible to eliminate several diamond operations."

TRY MACKLIN WHEELS ON *YOUR* NEXT JOB . . .
A trial will convince you.

Your Macklin distributor offers a fast, off-shelf delivery. Look for him in the yellow pages of your phone book. AND TO SAVE TIME, WHEELS AND DOLLARS . . . arrange today for a trial demonstration with a Macklin Sales Engineer or your nearest distributor. No obligation, of course.

FOR SPEED—ECONOMY AND PERFORMANCE . . . YOU CAN COUNT ON

MACKLIN

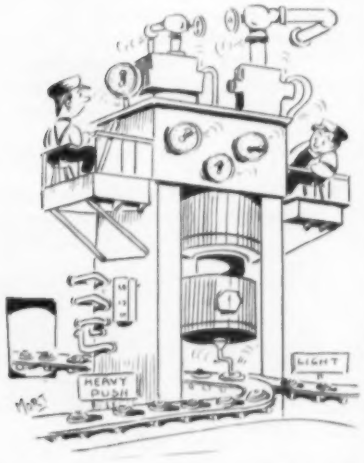
"WHEELS OF PROFIT"

MACKLIN company

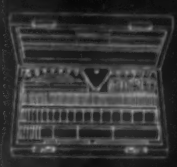
Dept. 70 JACKSON, MICHIGAN

tion between the foreman and his subordinates is necessary for the efficient production in his team, the fullest possible cooperation between the foreman and the man above—his own boss—is essential to smooth operation of the entire department. The foreman needs the respect, confidence, and friendship of his supervisor because he is one step above him in the management ladder and, therefore, more familiar with the directives and policies of management. But if the man who takes the foreman's job has to be a yes-man, and never gets a decent chance to try out his own good ideas to get production up to snuff because the supervisor knocks them down in favor of *his* dubious and unsatisfactory ideas, there can never be harmony, cooperation and efficiency in the department.

I am sure that Hadley's boss would have appreciated hearing the real reasons for the promotion turn-down. A good boss welcomes criticism. He knows that a company's best workers are apt to be its severest critics. It's not the poorest workers, it's the most productive ones, who criticize existing inefficiencies. If I had faced Hadley's dilemma I would have said "no" to the proposed promotion, but with this reservation: if the boss could promise to curb the undesirable activities of the supervisor, then the job would be acceptable. But to hide the real reasons behind the facade of reticence or fear of telling the boss the truth, and then worry because there would never be another chance offered for a foreman's rating after once turning the job down, shows



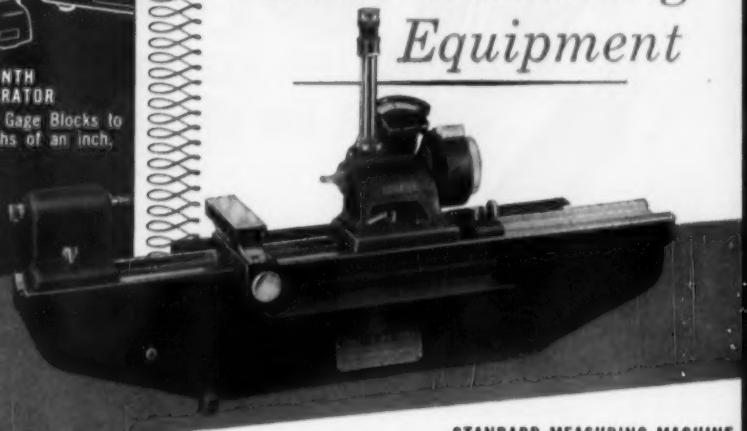
300 Ton hydraulic light action press for testing the push in push buttons as they come off the production line. From the drawing board of Push Inc USA.



PRECISION GAGE BLOCKS
Basic master standards of measurement, accurate to millionths.

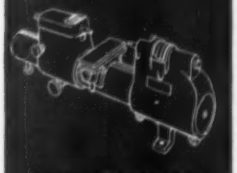
MILLIONTH COMPARATOR
Checks Gage Blocks to millionths of an inch.

To
Insure Quality
INSURE PRECISION
Use
PRATT & WHITNEY
Basic Measuring Equipment



STANDARD MEASURING MACHINE

ELECTROLIMIT UNIVERSAL INTERNAL COMPARATOR
Reads direct to .00002"



SUPERMICROMETER
Reads direct to .0001"

You'll have the best Quality-Insurance obtainable if you make it a policy to determine the *correct* degree of precision for *your* products and then maintain these limits . . . broad or close . . . dependably and accurately, year after year. And the *best* way to provide your plant with this *Basic Accuracy Protection* is by using Pratt & Whitney Basic Measuring Equipment as a constant check on the accuracy of your *working* gages.

The heart of Pratt & Whitney Quality Protection is the Standard Measuring Machine shown here. Reading direct to .00001", it's a basic unit for any Standards Room. Used with the other equipment shown, you'll underwrite Quality, insure Precision and receive lasting dividends.

Write, outlining your Quality Control requirements, for complete recommendations on Pratt & Whitney Basic Measuring Equipment to meet your needs.

PRATT & WHITNEY COMPANY
INCORPORATED
11 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities
MACHINE TOOLS • GAGES • CUTTING TOOLS

FORD
rotary tools

WHY THEY DO YOUR JOB BETTER

All Ford files H. S. S. and carbide cutters are *precision machine ground* . . . which insures that tooth spacing is uniform and relief angles are constant on each tool. Ford files are handcut by precision craftsmen. On your job, that means more parts per grind. So you save labor on grinding and tool changing. You save on replacements. You save on downtime. What's more, there's less time per part, more parts per hour. In 7 shapes . . . cutting head sizes from ⅛" to 1" diameter, up to 1⅜" in length. All standard, and *available* in H. S. S. or solid carbide.

Rotary FORD Tools

NEW CATALOG 601 FREE AND LATEST PRICES

. . . WRITE TODAY

M. A. FORD MFG. CO., INC.

735 W. RIVER STREET, DAVENPORT, IOWA

Precision manufacturer of Carbide End Mills • Countersinks • Grinding Burrs • Special Tools • Factory Regrinding

undue timidity and lack of good judgment.

In talking to the boss, I would stress my criticism of the conditions leading to the job turn-down in terms of "the company good." Too many employees worry about getting on the right side of the boss, while the whole secret is getting on the *same* side. The boss is working for the company exactly for the same reason his employees are. He wants a decent salary, the opportunity to advance himself, and a pleasant working situation. No matter how much of a "company man" he is, there's still that element of self-interest involved. However, the closer to the top he is, the more aware he is that the company's welfare is his. The common ground between employee and boss is there. If the employee can phrase what he tells him in terms to show how the company will benefit from the criticism, half the battle is won.

In the final analysis, who wants a foreman's responsibilities without the privileges of supervision? This reaction is understandable enough when the foreman can't make his own decisions in matters affecting his own department, when he can't correct wasteful work practices or recommend better ways of getting the job done, and develop improved methods. Who wants to be a foreman under these circumstances? Unquestionably, it takes a foolhardy individual to accept a foreman's job completely controlled by a dictatorial supervisor who demands virtual subservience to his demands. That is why, in my opinion, Hadley should not have been afraid to speak up about the troublesome supervisor. But he should have left a way open to accept the proffered promotion upon removal of the objectionable features of the job. On that basis, further chance for a foreman's rating would have been possible.

Harry Kaufman
Philadelphia, Penna

BOW AND SCRAPE, OR STAND AND FIGHT?

Should a foreman be willing to take orders from Engineering on such things as machining a new material? Or should he insist on full authority in his own department with consequent responsibility if something goes wrong?

THE modern shop and industrial plant is an integrated organization of specialists. At the present advanced stage of industrial progress it is becoming difficult for even the highly specialized technicians to keep up with all the latest developments in their field. It is unwise for anyone to try to become an expert in more than one field.

The intelligent man is not the one who simply knows his own field. It is the man who knows his field and also knows the boundaries of his field and has the good sense to seek help when he is outside these boundaries.

Specialization is dependent upon cooperation. If organized cooperation and team work should cease it would spell the end of specialization and we would each be forced to grow our own food with whatever tools we could make ourselves.

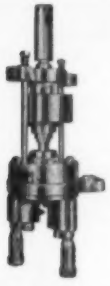
The prime duty of management is to foster the cooperative spirit in the plant for this is the very foundation of modern industry. The same machines and know-how are available to all; techniques and methods cannot be kept secret very long. If a plant is to succeed and not be forced out by competition they must have that all-important factor, cooperation within and between departments. Cooperation within the department is necessary because no one, not even the foreman, is an expert on all machines and all phases of the work. Cooperation between departments is vital for no department is independent and complete in itself.

Every foreman realizes these

"Like I said . . . those new trucks got a hellova quick pickup."

FULLY ADJUSTABLE DRILLING HEAD

Here's a light, compact tool with a wide range of adjustment. Can drill on squares, rectangles, circles, triangles and irregular patterns.



ADJUSTABLE TAPPING HEAD

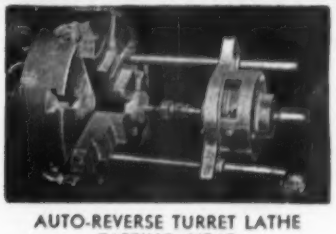
Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case.

ADJUSTABLE DRILLING HEAD

This versatile tool permits you to take advantage of a wide range of adjustment without overhang.

UNIVERSAL JOINT DRILLING HEAD

This dependable tool is adjustable to any pattern of holes. Available with 4 to 12 spindles. All aluminum housing construction, thrust bearings and gears turned on spindles.



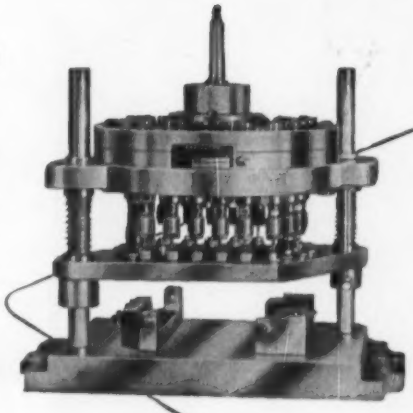
AUTO-REVERSE TURRET LATHE TAPPING HEAD

A new tool, practical, time-saving, money-saving. In a turret lathe setup it allows you to tap the hole and back out the tap without stopping the work or reversing the machine.

FOR MULTIPLE DRILLING OF HOLES ON PRODUCTION RUNS . . .

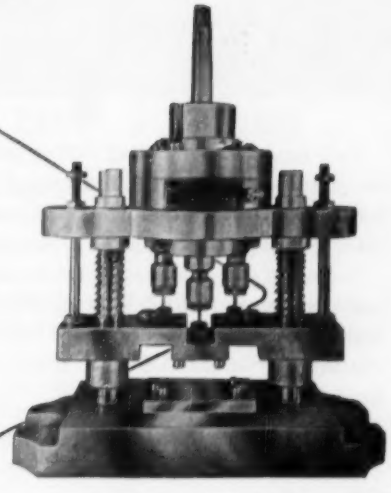
ERRINGTON

FIXED CENTER DRILLING HEADS with JIGS and FIXTURES



Custom Built to Your Specifications. Send Blueprint for Quotation Without Obligation.

Do more . . . and do it better with Errington Fixed Center Drilling Heads. They drill any number of varied size holes on different elevations. The head has grooved thrust ball bearings at all thrust points and hardened bronze radial bearings. Heat treated spindles and gears, of one piece turned from solid bar stock. It is geared approximately 2:1. All enclosed in a sand-cast aluminum case and cover, with alemite pressure lubrication.

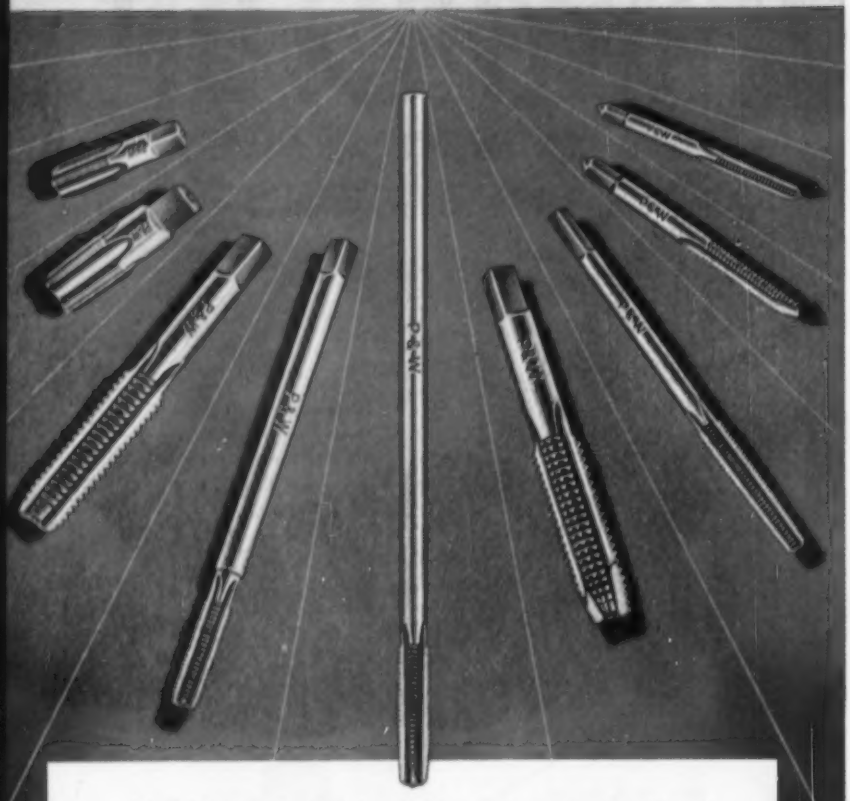


Send for Complete Catalog

ERRINGTON MECHANICAL LABORATORY, INC.
Established 1891
Main Office and Plant: STATEN ISLAND 4, N. Y.
Export Office: STATES TRADING COMPANY 401 Broadway, New York 13 Cable Address: STRADESCO, N. Y.

PRATT & WHITNEY
Quality TAPS

for the long run . . .
because they run longer!



Next time you're figuring tooling costs, remember it's not the purchase price that's most important. It's what you get for your money . . . the number of clean, accurate threaded holes each tap delivers on the production line!

Correctly designed, carefully manufactured and rigidly inspected, *every* Pratt & Whitney Tap you buy has the same high quality. There is a complete line for all your needs . . . available from on-the-shelf stock at Pratt & Whitney Branches everywhere.

Write now for P&W Ground Thread Tap Circular No. T-583 and Cut Thread Tap Circular No. 541.

PRATT & WHITNEY COMPANY
INCORPORATED

11 Charter Oak Boulevard, West Hartford 1, Connecticut
Branch Offices and Stock in Principal Cities

MACHINE TOOLS • GAGES • CUTTING TOOLS

things at least to a degree and knows how important cooperation is to the success of his own department. The best way to obtain cooperation from his men is for the foreman to set a good example by cooperating with the other departments in the plant. If engineering has the prerogative of presenting information on the speeds and feeds to be used on a particular job, Ed should accept this arrangement even if he doesn't like it.

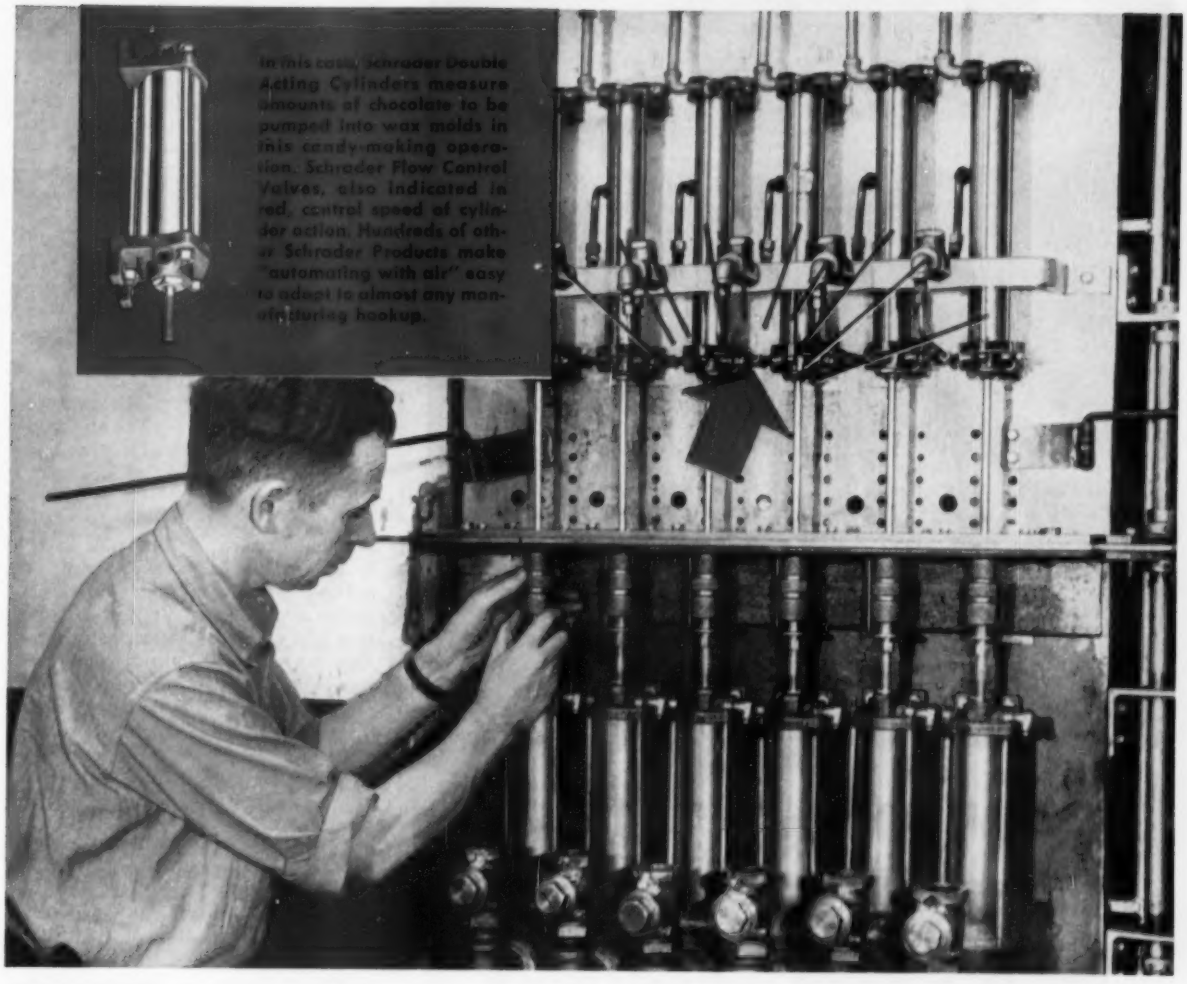
Ed may have had 20 years' experience in the shop but he should still respect the position of the men in the engineering department. He may be possessed of that animosity that most shop men have for office workers who sit at a desk, but he should remember that they are there for a good purpose and may be very capable. We should respect and make every effort to operate under the system set up by management. They hired the engineers to perform a certain function and Ed should do all he can to help them do a good job.

Sing Yen
Brooklyn, NY

BOW AND SCRAPE, OR STAND AND FIGHT?

ONCE upon a time there was a plant in which the shop personnel and the engineering department decided to bury the hatchet—and not in each other's head—which would have spelled finis for all concerned. So they got together, as sensible men should who have a stake in an enterprise, and decided that when any job that meant new procedures came up, such as machining a new alloy, they would get together all the data pertaining thereto and confer with

"Oh! Oh! Who is the boss going to put on the carpet today?"


In this case, Schrader Double Acting Cylinders measure amounts of chocolate to be pumped into wax molds in this candy-making operation. Schrader Flow Control Valves, also indicated in red, control speed of cylinder action. Hundreds of other Schrader Products make "automating with air" easy to adapt to almost any manufacturing hookup.

Schrader Air Products fill candy molds with chocolate measured to ± 1 gram

Problem: To mass-produce candy figurines, filled solid with chocolate—a tricky sweet to handle. **Solution:** One Buffalo company uses a battery of Schrader Air Cylinders which measure the chocolate to within one gram, and precisely, neatly, swiftly fill the figures.

The uses of Schrader Air Products are limited only by producers' imaginations. Versatile, safe, simple and fast, the hundreds of different units in Schrader's complete line can be employed singly or in combinations to perform automatic operations. And wherever air is used, economies are gained that increase its efficiency even more.

Think air whenever you think automation—in holding or positioning work, moving scraps or chips, or synchronizing actions. Upon request, Schrader engineers will assist you in planning for your best use of air, and in selecting the products best suited to your applications. Outline your problem and we'll be glad to help. Or send for the latest informative booklets which show Schrader Air Products that will simplify your production.

Schrader®
ESTABLISHED IN 1844

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn 38, N. Y.

FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL

CUT BAR STOCK up to 5/8" Diameter

Do it Accurately, Instantly with a DI-ACRO* ROD PARTER

The shearing-breaking action of a Di-Acro Rod Parter allows most bar stock to be cut without burr and distortion. After parting, the bar is easily inserted into a hole its same diameter and the end can be threaded or riveted without further processing.

Holes in cutting heads accommodate eleven different round stock sizes. Also special heads for cutting square, and other shaped bars.

BOTH HAND AND POWER MODELS AVAILABLE

Instantaneous cutting action with Di-Acro Power Rod Parter. Rate of production limited only by speed with which stock can be fed. Motor driven flywheel, other moving parts housed in welded steel cabinet.

New Rod Parter book is yours for the asking. Write or call today.

Consult the yellow pages of your phone book for the name of our nearest Di-Acro distributor or write us.

*pronounced DIE-ACK-RO

di-acro PRECISION METALWORKING MACHINES

Creators of "Die-Less Duplicating"

O'NEIL-IRWIN MANUFACTURING CO.

405 8th Avenue • Lake City, Minnesota

one another to the end that all machining headaches would be eliminated.

In arriving at this much-to-be-desired conclusion, they had first to divest themselves of the idea that each one of them carried in his own head a complete symposium of all knowledge pertaining to the fabrication of metals—irrespective of how many years they had pursued this nefarious vocation. It was not easy to absorb a simple truth that should carry the conviction of Holy Writ. That simple truth being—Nobody Knows It All.

But they persevered, and today that plant is a model in the industry, and people come from far and wide to sit in at a conference between engineering and their colleagues in the shop.

I think I have stressed the moral to this story, to wit—nobody knows it all. Maybe, however, there are several sub-morals that might be mentioned, such as: get the dope before you get sore, or get together and kick it around. If you put your mind to it you, too, could think up a better one. Right now I'm trying to clean up my desk—I have a golf date with Finlay of Engineering Planning—pretty good guy with a slide rule, but his chipping leaves much to be desired!

Robert S Alexander
Glastonbury, Conn

BOW AND SCRAPE

IN THIS instance the engineering department did not order the speeds and feeds on the new aluminum alloy rings. They simply made a recommendation on the information they had. Harrison got mad and called up Greaves, who in turn got mad, and ordered Harrison to do as engineering says—or else. This is

"Hey, tell that new man you go in after punching the time clock!"

usually what happens when the boss gets mad. Anger interrupts reason. When we lose reason we lose control.

As I see it, there were several mistakes on the part of management. Mistake one and two when both Harrison and Greaves got mad. Mistake three was Greaves' threat to Harrison. Engineering was wrongly accused of giving orders, which was mistake four. Mistake five is the apparent lack of standardization of procedure in this company. The engineering department is an aid to the line and the successful running of a business. The fellow in the shop does not always agree with engineering, and sometimes rightfully so. The data from one shop does not necessarily fit another. The superintendent or works manager is responsible for top quality production. He makes the decisions on policy and procedure. He knows all staff members are important to the final finished product. He has the services of various other staff members. He has all the data available to sort out, keep what is worth keeping and discard what he cannot use.

A E Salmons
Norristown, Penna

JUST ONE BIG HAPPY FAMILY

Is the foremen's meeting a legitimate place to get across "team spirit," and enthusiasm? Or should it be a forum for discussion of departmental problems and their solutions? Do foremen need pep talks to keep them alive and awake?

THE USE of foremen's meetings just to sell the company and how much it is doing for the foremen and the workers often backfires. The reason usually is that it is not a sincere effort and is being used as smokescreen for the purpose of covering up the poor relationship that actually exists. It is the same old thinking that two wrongs will make a right.

Perhaps the company, at the very highest level, means well but by the time it has filtered down to the superintendent or some other department head it has become distorted and certainly out of place. We find that often the very worst offenders in selling company loyalty to foremen are those whose sub-executives are the least qualified to actually hold their own jobs.

Because they don't know how to properly carry out or develop a program that will build loyalty, they preach it. This gets to be a chestnut with the foremen and sooner or later

HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

It saves money in paint shops!

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

It saves money in plating shops!

Oakite Rustripper removes rust or heat scale from steel at the same time that it removes oil and other soils. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

FREE

For more information about how Oakite Rustripper eliminates operations in paint shops and plating shops, send for one or both of the illustrated booklets listed in the coupon.

Technical Service Representatives in Principal Cities of U. S. and Canada

•

Export Division Cable Address: Oakite

OAKITE PRODUCTS, INC.
24 Rector Street, New York 6, N. Y.

Send me free booklet checked below:

☐ "Here's the best shortcut in the field of organic finishing"

☐ "Here's the best shortcut in the field of electroplating"

Name_____

Company_____

Address_____

STUPALOX

Sintered Oxide

CUTTING TOOLS

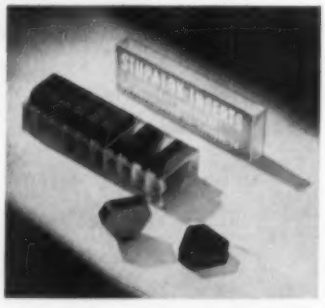
OUTPERFORM OTHER CUTTING TOOLS TWO TO TEN TIMES!

Deeper cuts, faster speeds, greater hourly production, machining the "unmachinable"—these are typical results discovered in scores of tests of STUPALOX versus other cutting tool materials.

Comparative performance studies of various tools in production shops, under normal operating conditions, brought out the relative abilities of each material. In these tests, STUPALOX outperformed other tools TWO TO TEN TIMES! In many cases, the full potentialities of STUPALOX could not be realized because of the limitations of power, or the rigidity of the machines in which the tests were performed.

As a direct result of these tests, a number of companies have already standardized on Stupalox tools, with gratifying improvements in machining costs and production.

Stupalox tools are available in several styles and sizes of inserts, and in commercial quantities. We will be glad to send you specific information on experiences with Stupalox for machining a wide variety of ferrous and non-ferrous metals.



HANDY PACKAGE...
This compact plastic box contains ten Stupalox sintered oxide tool inserts.

STUPAKOFF DIVISION OF
The CARBORUNDUM Company
WRITE DEPT. AM LATROBE, PENNSYLVANIA

turns them against all company policy. No, they don't admit it, for that would be a sure way to lose their jobs.

Naturally a company is successful only if the entire organization is working as a team with no one dragging his feet or pulling in the opposite direction. Generally a company does not fail if teamwork is present. When there is friction—no matter how small it may seem to those constantly embroiled in it—the fact remains that not everyone is going in the same direction toward the same goal, that is, company success. Of course, the results are not the best that can be obtained.

It appears sometimes that the only way to get foremen to properly show loyalty to the company is to have get-togethers and have the general manager or a vice-president talk about what the company is doing for them. But let's not forget that you are talking to a group of hard-headed, quick-thinking men who have usually come up from the ranks. They know when words are hollow, and too often they are at these meetings. A lot of fellowship is thrown around but the next day the general manager is too busy, or the social structure is not just right to be friendly with the same men.

This problem is not new, nor will it be solved by any discussion, for the basic principle lies in the fact that as men achieve higher positions they feel they must show their authority by stepping harder on the lower ranks. They must praise themselves, and, no matter what comes, they are "the best." Why this attitude? Let's say it's human nature again — one of those unfortunate

"I actually started this business with a loan of several hundred dollars."

Here's the story...

ON Century's

NEW SMALLER, BETTER MOTORS 1 TO 30 H.P.

In this revealing book, Century shows how and why the *New Standard*, smaller motors actually outperform the larger, heavier Old Standard models.

These trim, compact "*New Standards*" give you weight savings up to 40% . . . plus space savings and easier installation. Dead weight and dead air space are eliminated. The "active materials," such as iron and copper, are designed to give greater efficiency than ever before. New synthetic insulating materials give greater dielectric strength and uniformity.

SEND FOR YOUR *PERSONAL* COPY OF THIS VALUABLE DATA BOOK . . . !

Mail this coupon today!

To CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Mo.

Please send New Bulletin 6-1P1 to:

Name..... *Title*.....

Company.....

Address.....

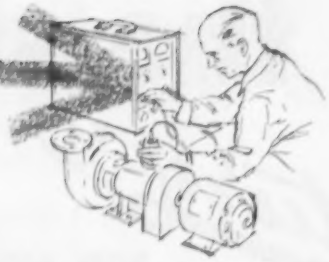
City..... *Zone*..... *State*.....

Performance Rated©
MOTORS
1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

3 WAYS YOUR COMPANY CAN BENEFIT using portable IRD vibration analyzers



CHECKS MACHINERY OPERATION AND CONDITION — measures permissible vibration and balance tolerances.

FAST TROUBLESHOOTING — quickly pinpoints part causing vibration.

DYNAMICALLY BALANCES, "IN-PLACE" — without costly tear-down.

No matter what your product or process, IRD vibration analyzing and portable balancing equipment can help you make it better . . . and at less cost.

Hundreds of manufacturers are utilizing IRD vibration analyzing equipment as a fundamental in their plant programs to attain greater production precision, efficiency and quality on machine tools; smoother operation and longer life on pumps, motors, blowers, generators, gyros and all types of rotating equipment.

Write today for an *in-your-plant* demonstration

Perhaps you have machinery that's operating a bit rough, right now. We'd be happy to have an IRD Sales Engineer demonstrate on your equipment. Just write or phone. No obligation of course.

IRD
vibration analyzers

International Research and Development corp | 802 thomas lane, columbus, ohio

quirks that we may not be proud of, but which is inherent in many people.

Any company who wants to build the team spirit, and companies have done it, must start to build at the top, not by words, but by action. This doesn't mean to pay the highest wages in town or put on the biggest show, but it *does* mean hard work by the president and all the way along down the line. It means training of foremen by using the proper tools, not by meetings accompanied by hollow words. It means supervisors who know how to do their job and how to accomplish things, and delegate authority. Teamwork must be developed, not preached.

Charles D Townsend
West Hartford, Conn

COFFEE BREAK, WORK BROKE

Is the coffee break a symbol of increasing laxity in shop working conditions? Is productivity actually affected one way or the other by an official "time out for relaxing"?

THE worker in the shop or factory is subject to a variety of forces. These forces differ in their direction, and their size and effectiveness. The amount of work he turns out is determined by all of these forces.

On the one hand he is faced with the positive forces, urging him to produce. These take a variety of forms, the basic one being the desire to keep one's job. There are many in the plant for whom this is the only positive force. The desire for advancement in salary and position

"I know ya like hard boiled eggs, but where'd Bertha get that one?"

provides a secondary incentive for some. Occasionally there will be a rare individual who takes a real, avid interest in his work for the sake of the work itself. He just likes the work he is doing and the pleasure he derives from doing a good job serves as a powerful positive force.

In the opposite corner is a concentration of negative force, all directed toward the reduction of production. Principal among these is human inertia and apathy. Although the men feel and tell themselves that they want to do the work, and keep up production, there is that ever-present urge to stop and relax for a moment. It is so easy to make an excuse to take a few minutes out from the job and so difficult to resist this urge that the man just stops. Each time he stops it becomes easier to stop and harder to start.

This is the way people are made and it is necessary for management to constantly combat this urge. Periodic rating periods, production drives, and constant pressure are necessary to prevent the growth of this attitude. One of the most effective ways to maintain a high level of production is to initiate an incentive system.

Henry George
Yonkers, NY

"COFFEE BREAK, WORK BROKE"

TECHNIQUES for increasing productivity are sometimes rather complex in conception and indirect in effect. But a memo I recently saw posted on a company bulletin board tries the opposite approach:

"TO ALL EMPLOYEES:

Due to increased competition and a keen desire to remain in business, we find it necessary to institute a new policy—

Effective immediately—

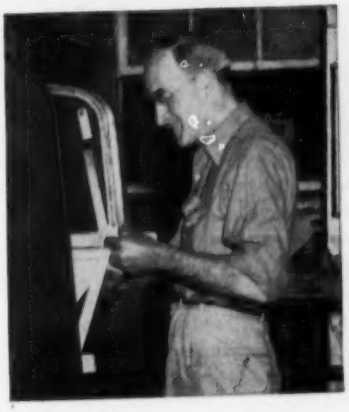
We are asking that somewhere between starting and quitting time and without infringing too much on the time usually devoted to lunch period, coffee breaks, rest period, story telling, ticket selling, vacation planning, and the rehashing of yesterday's TV programs, each employee should endeavor to find some time that can be set aside and known as the 'Work Break.'

To some this may seem a radical innovation, but we honestly believe the idea has great possibilities.

It can conceivably be an aid to steady employment and it might also be a means of assuring regular pay checks.

While the adoption of the Work

Universal Winding Co. Cuts Tool Costs With McCaskey Tool Crib Control



Since installing McCaskey Tool Controls, the Universal Winding Company of Cranston, R.I. reports a big improvement in shop efficiency and major reductions in operating costs.

Mr. J. W. Egan, Tool Supervisor, says McCaskey Methods have been used since 1952 in the two main tool cribs for both their textile twisting and winding machines and for their electrical coil winding machines. He high-spots the benefits:

"McCaskey Tool Crib Control has not only tied responsibility for specific tools to each employee but has enabled us to get a monthly report on worn and damaged tools which are charged to each department. Also, tool crib operation has been speeded up now that the location of all tools on the floor can be readily determined."

Mr. Egan adds: "By disclosing dead and infrequently used tools, as well as any excessive inventory of active items, McCaskey has enabled us to cut our overall tool inventory and save considerable money."

Comparable operating savings can easily be yours. McCaskey has Tool and Gage Controls and specific control systems to offer money-saving benefits regardless of your products, or the size of your plant.

Find out how McCaskey eliminates such costly operating expenses as tool loss and theft, high breakage, unbalanced inventories, and production delays. Mail coupon today for free booklet. No obligation, of course.

McCASKEY INDUSTRIAL CONTROLS
Production • Inventory • Tools • Maintenance • Costs
Division of
VICTOR ADDING MACHINE CO.
3900 N. ROCKWELL STREET • CHICAGO 18, ILLINOIS

VICTOR-McCASKEY LIMITED,
GALT, ONTARIO

Manufacturers of Business Machines
Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.

Victor Adding Machine Company
McCASKEY INDUSTRIAL DIVISION
3900 North Rockwell, Dept. AM-1136
Chicago 18, Illinois

Please send me your new booklet: "How Tool Costs Were Cut 12 Ways in 20 Plants."

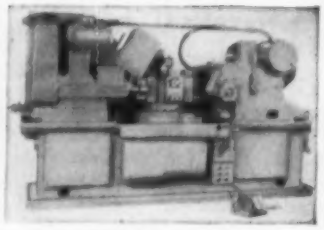
Name .....
Position .....
Company .....
Address AM-1136

...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.



A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
PRODUCT-QUALITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Break Plan is not compulsory, it is hoped that each employee will find enough time to give the plan a fair trial."

Things are indeed getting too sloppy in the shop when management has to ask the workers to take time out for work from the welter of coffee breaks and other symbols of too-relaxed working conditions. From personal experience I can sympathize with the foreman who sees his men standing around, instead of starting work when they are supposed to, and gabbing about last night's TV shows. No wonder he's getting fed up with the way a lot of them are putting their own personal requirements ahead of their job requirements and taking advantage of extra-fringe benefits. They get rest periods, coffee breaks, and time out for other benefits, and you'd think the least they'd do is work a little harder to compensate for all these concessions.

That is why I believe this: if a company has any desire to stay in business it's about time its management instituted a new policy. Management, through its foremen, should tell the men to get busy. The economic facts of the company's continued existence should be brought home to the men. The bothersome thing about the coffee breaks and similar free-loading concessions is that someone has to foot the bill. It isn't complicated economics to figure out that rest periods and other breaks on such a basis are a luxury a company can ill afford.

Tolerated idleness has been allowed to grow simply because no one seems to do anything about it but cry that "employees have it too

"You missed all the fun at the shop picnic . . . after the beer was served someone tried to cram the boss's nose into a wiener bun!"

"Finish first in your league"

...with J&L COLD FINISHED LEADED STEELS

These modern, superior J&L Leaded free-machining cold finished steels are meeting with outstanding acceptance in machine shops everywhere. They are a star member of the complete line of premium quality, free-cutting cold finished bar steels produced over the years by J&L specialists. Thus, we can recommend the right type to help solve your particular machining problems.

Available in *both Bessemer and Open Hearth grades*, J&L Leaded steels offer:

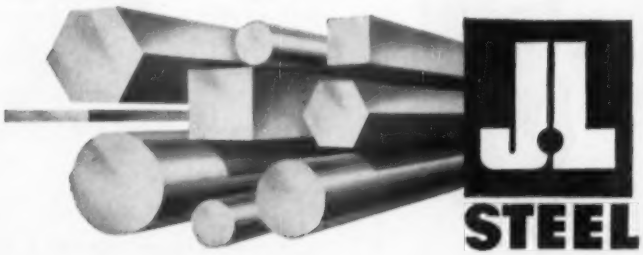
● **SUPERB MACHINABILITY**—because they enable you to use optimum cutting speeds, to secure longer tool life and to produce superior surface finishes.

● **GREATER UNIFORMITY**—because they are completely J&L-produced from the basic raw materials to guarantee optimum uniformity which is so necessary for modern industry's high-speed machining operations.

● **HIGHEST QUALITY**—because they must meet the rigid quality standards developed by J&L through years of leadership in the development and production of free-cutting steels.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT
PITTSBURGH, PA., AND HAMMOND, IND.

Dependable is the word for

Ruthman
Gusher
Coolant Pumps

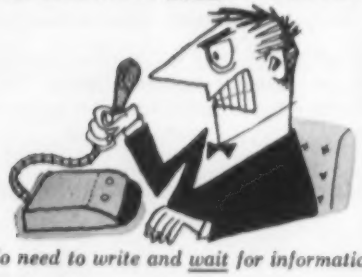
Designed simply, with fewer moving parts to wear, Gusher Pumps are the last word in dependability. Pre-lubricated heavy-duty ball bearings require no further attention. There is no priming or packing necessary. Your Gusher pumps give you instant coolant flow from the moment the machine is started. Specify Ruthman Gusher Coolant Pumps.

Illustrated is a Model VH-6 WP Hammond Abrasive Belt Grinder equipped with a Ruthman Gusher Coolant Pump.

THE **RUTHMAN** MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

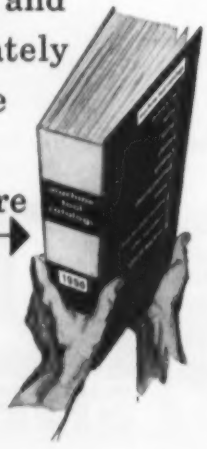
NEW MACHINE TOOLS ON YOUR MIND?

No need to wonder where you'll find them



No need to write and wait for information

the new catalogs of 69 leading manufacturers of machine tools are pre-filed indexed and immediately available to you right here



Metalworking production's most convenient, always accessible source of machine-tool-buying facts.

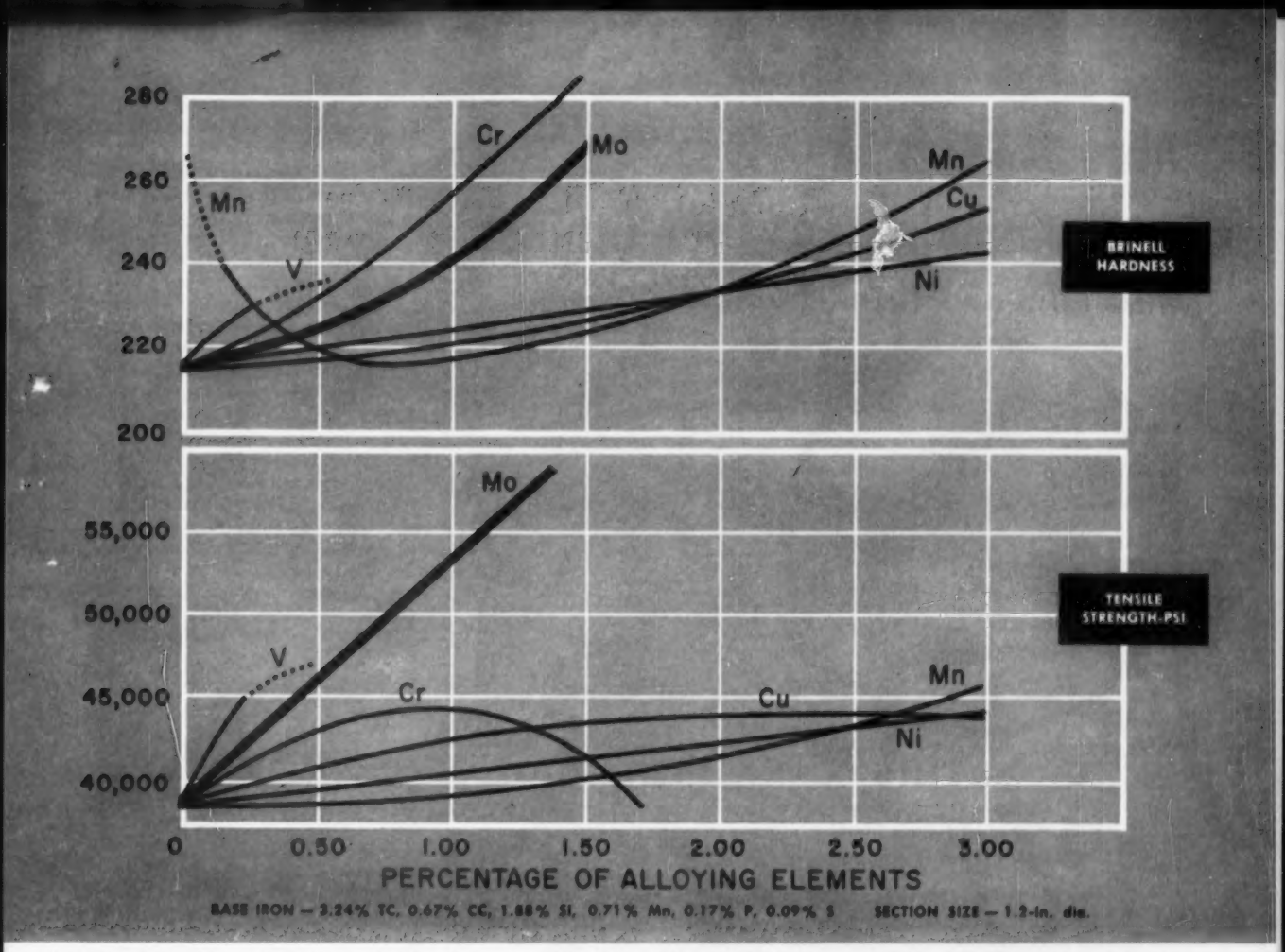
"Machine Tool Catalogs...a great time-saver."
Sweet's Catalog Service
Division, F. W. Dodge Corporation, 119 W. 40th St., N. Y. 18

easy." Regular rest periods, fear of sweat, coffee breaks, over-manning due to unnecessary specialization, a general attitude of "give us more while we produce less": all these add up to a terrific cost that should not be part of anyone's pocketbook for the very real reason that the productive value is absolutely blank. I think it's about time that something should be done about it, and it's up to the supervisor himself, as management's representative, to do something. If employees stand around or take it easy, who but their leader can put them back to work? The foreman as management's representative has the responsibility for getting value for wages paid the workers.

As far as coffee breaks and the like are concerned, management authorized these concessions, and it's up to management to curtail these benefits, upon the advice of its foremen, when they generate free-loading. The theory management has been operating under that employees will appreciate generosity and their gratitude will be conducive to improved morale and higher productivity, is not working out in actual practice. There is no easy way to improve employee relations. Generous benefits are not as important as steady employment and high wage scales. The elementary facts of industrial life have escaped many employees: that a course of conduct which places upon an employer conditions which are unsuited to his business, or burdens which his business cannot bear, will ultimately adversely affect the prospects of his employees. It is in his own self-interest for the employee to give the employer the maximum "work break." It's also employee responsibility to do a fair day's work for a fair day's pay.

In the final analysis, some measure

"Your wife leave you, Smithers?"



Note how additions of moly, up to 1.5%, produce proportional improvements in strength. And, with moly, hardness increases much more slowly. It means higher strengths can be used with less danger of impaired machinability.

each ½% Moly adds 7000 psi to strength of cast iron...

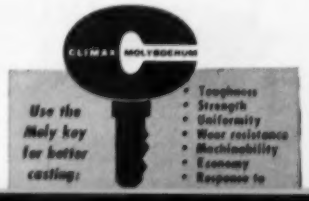
A little moly adds a lot of strength — for molybdenum increases strength more than any other common alloying element, with the exception of small vanadium additions. A rule of thumb is that fifty points of moly raise tensile strength 7000 psi. And without sacrificing toughness. Actually, moly improves toughness at least as much as strength.

What's more, versatile moly aids in obtaining uniform response to heat treatment . . . and in producing machinable, growth-resistant castings. Moly is easy to use, too.

With most grades of cast iron, moly requires no change in the character of the charge, normal melting practice, or the base metal. And foundrymen like the fact that the small additions necessary may be made at the spout or in the ladle.

Write now for "Why Moly Iron". It's the full story of how and why moly adds strength faster than hardness, how it increases fatigue and torsional strength—in short why moly makes better cast iron. Climax Molybdenum Co., Department 12, New York 36, N. Y.

CLIMAX MOLYBDENUM



Abrasive Cutting | *the best way to cut many materials the only way to cut some*

Campbell Cut-Off Machines

WHAT KIND OF A CUT DOES YOUR JOB REQUIRE?

THIS Clean, smooth edges that require no further finishing

or THIS Rough, serrated edges that must be machined if smooth finish is required

• The smooth cut—made on a CAMPBELL Oscillating Wet Abrasive Cut-Off Machine and the just-right ALLISON Abrasive Wheel for the job—saves a grinding operation at a Midwest gear plant.

Another combination of CAMPBELL Cut-Off Machine and ALLISON Wheel cuts stainless steel tube twice as fast as by other methods for a large aircraft manufacturer.

Can you cut tough K Monel, 4¾" dia., in two minutes per cut by present methods? Whatever your problem, our abrasive cutting specialists can improve your cutting operation and save you money.

OSCILLATION makes these big cuts with speed and economy

• The cross section of gear teeth (*shown left above*) is cut smooth, fine-finished and ready for metallurgical study.

It results from the wet cut of an Oscillating CAMPBELL Abrasive Cut-Off Machine with abundant coolant applied just where it does the most good. The Oscillation of the ALLISON Abrasive Wheel, the right one for the job, handles big cuts like this with speed and economy.

If your cutting involves alloy or high carbon steel, this CAMPBELL-ALLISON combination just can't be beat.

Let us send you this book

ACCO

Campbell Machine Division
AMERICAN CHAIN & CABLE

923 Connecticut Avenue • Bridgeport 2, Connecticut

of relaxation such as a 10-minute coffee break midmorning and midafternoon is helpful as a fatigue-breaker. But a surfeit of benefits and concessions will neither do the worker or management any good. I suggest that we may be trying too hard to make workers happy, and not hard enough to make them successful. There is some question whether people are made happy by being surfeited with benefits. Too many benefits destroy self-respect and even the sense of security. When things are going too well, people sometimes have an intuitive feeling that it can't last.

In my estimation, relaxed working conditions have reached the sloppy point where it becomes the duty of the foremen to tell their men that they can have steady jobs only at the price of an honest day's work.

Harry Kaufman
Philadelphia, Penna

COFFEE BREAK . . .
WORK BROKE

WHEN the production in the shop falls off it is the fault of top management. The fault is directly traceable to them; it matters not if it is due to poor planning, poor equipment, or too much time out for coffee or rest periods. They are the source of the directive effort and are directly responsible for the success or failure of the enterprise. It is top management who has the incentive to maintain and increase production for it is their position that is jeopardized by reduced profits. The owners or stockholders hold them liable for all activities in the plant. It is true that the man in the shop will lose his job if the company closes, but concern

"No more for me, Fellows! I have to drive!"

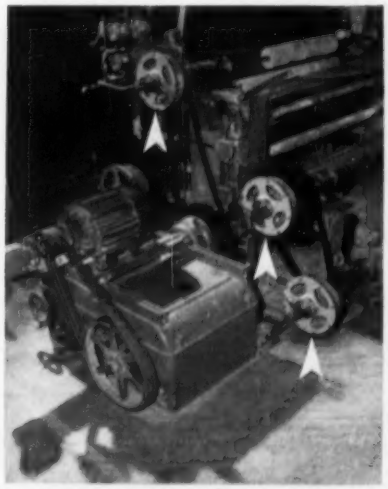
FAWICK Standardized CB Package Applications are adaptable to cyclic or continuous operation and may be operated by manual or electro-pneumatic controls, locally or remotely. They perform clutch or brake functions on machines with moderate power requirements.

FAWICK STANDARDIZED CB PACKAGE APPLICATIONS GIVE YOU...

modern pneumatic power transmission at low cost

Conversion of your machinery to modern air operation is a simple matter when you use FAWICK Standardized CB Package Applications. The packages are complete and ready-to-install. They include a FAWICK CB Airflex Clutch, FAWICK Rotorseal, drum and mounting components. Tapered bushing construction provides standardized bore sizes for easy installation. Where application is necessary, anti-friction bearings are used as illustrated above. Three basic designs are available: spider bearing mounted, gap mounted or close mounted.

The price is low! Volume production of these FAWICK units and availability as "off the shelf" items eliminate costly custom engineering and assure speedy delivery. Consult your nearest FAWICK Representative or the Home Office for more information. Ask for Bulletin ML-173.



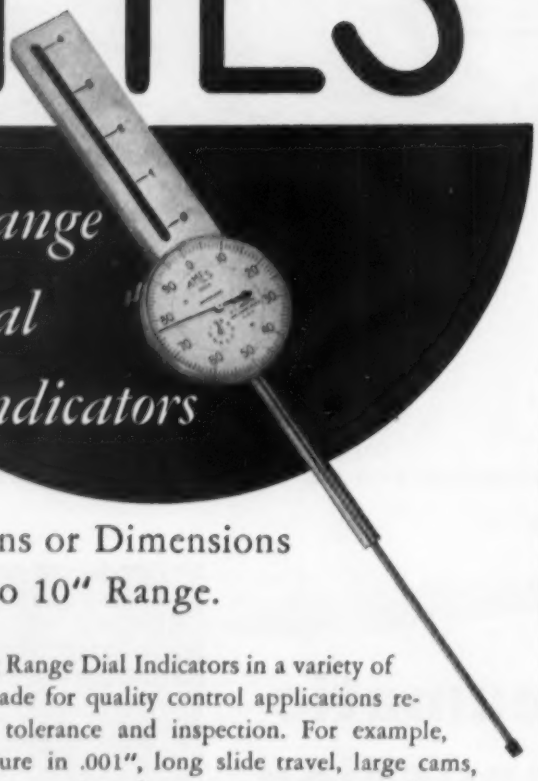
The B. F. Goodrich Company uses Standardized CB Package Applications for power transmission on this Sheet Stock Packing Machine. The clutches also perform slip clutch and tension brake functions during winding and unwinding operations. Sensitive response to controls permits close adjustment of tension and slip. The low-maintenance feature reduces machine down-time.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
In Canada: Fawick Canada, Ltd., Toronto, Montreal

FAWICK Airflex
INDUSTRIAL CLUTCHES AND BRAKES

AMES

Long Range Dial Indicators

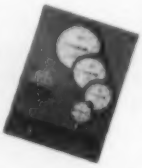


Check Motions or Dimensions
In .001" up to 10" Range.

Ames Long Range Dial Indicators in a variety of models are made for quality control applications requiring close tolerance and inspection. For example, you can measure in .001", long slide travel, large cams, deep recesses or other dimensions requiring indicator spindle travel of up to 10".

In addition, Ames Long Range models have all the advantages that are built into Ames regular indicators:— dials of large diameter; easy-to-read, widely spaced graduations; movable dials; replaceable contacts. All Ames Long Range indicators have count hands to indicate revolutions of the indicator hand. Those with box covered, rack guide have a slot in the cover graduated to register each inch of spindle movement.

Write today, sending your problem in long range measuring. Ames will be glad to suggest a solution. Be sure to include drawings and specifications — your answer will be back faster if you do.



Representatives in principal cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

over the company's financial success is far removed from his thoughts.

As with all human efforts, his actions are the result of the dictates of his desires and his objectives. He wants to earn a living and conducts himself with this as his goal. It is axiomatic of human behavior that we prefer to do things the easy way. If the conditions in the shop are such that a man can get paid for little effort, why work hard? He is there to attain an objective and he does it the easy way.

If left entirely to itself the production in the shop will naturally be subject to a gradual decline. No one feels that he should exert much more effort than is being expended by the other employees. The general tendency is to turn out the minimum necessary to keep one's job. The minimum is not a fixed amount and tends to decrease. The employees can turn out more than this minimum, and will, if management makes the necessary effort. When production and employee morale have dropped to a low point a real shakeup is necessary—perhaps a few new men in key positions. When production has been raised it can be maintained at a satisfactory level by a constant effort. It requires exertion and push on every level. The men must push the machines and the foreman and group leaders must push the men. The pressure they apply results from the demands of management. In all cases the push or driving force must originate at the top.

Clifford Molloy
New York, NY

COSTS SCHOOL FOR FOREMEN

Can a training program on shop costs benefit a foreman, or is it a waste of time for an old-liner who feels he knows his own department's costs inside out?

ANY training program is always met with the comment "It's for the birds," and yet these same people who make such remarks know little or nothing about the subject. After we leave college we seem to think nothing new can be developed that we don't know. As our age creeps along we grow more and more self-centered and feel that any attempt at further education is a foolish thing.

Yet many foremen who have never had the benefits of higher education feel the same way, so we find that all strata of society, once they get into supervisory positions, feel that they are the chosen people who can do

no wrong and never need to know anything about the finer points of running a business.

Production costs can be very tricky. It is not always the simple "two times two" stuff which we try to make out it is. Many factors of overhead, sales costs, office costs and a hundred and one hidden factors must be at least looked at in conjunction with the cost of producing the product.

A foreman is hired to run his department. In the real old days he did it by knowing more than all the rest of the shop about how to do each and every job. He ran the shop as he saw fit. Many were successful because then the few mills which were lost meant very little in the over-all success of the company.

Every other company operated in the same way, and the prices were not the prime factor. We went in for quality; price was usually secondary. Today, we reverse the procedure, for price is of first importance and quality will be maintained if the price can be met and a profit realized.

So our modern foreman must, if he is going to do his job right, know what his operations are costing him. He must operate his department as a company and make it profitable. If he doesn't, then the company will not be successful and some day he will be out of a job.

Our great failure in the education of our foremen is the matter of properly presenting the case. Our executives are too busy to really understand what should be done. It, to them, is something to just "order" —much as they would a steak—and then serve it. They don't realize that the program of education must be

"I understand he's the specialist on heat treating!"

Plastics modified with "THIOKOL" Liquid Polymer cut tooling costs in aircraft production

DOUGLAS SKYWARRIOR A3D-1. Many integral parts for this twin-jet U. S. Navy bomber are formed by plastic tooling.

Plastic tooling compounds based on "Thiokol" Liquid Polymer are speeding production and reducing expenses at the El Segundo Division of Douglas Aircraft Company, Inc. Working with Rezolin, Inc., a compound manufacturer, Douglas Aircraft has developed some successful tooling procedures.

Tooling compounds combining epoxy resins and "Thiokol" Liquid Polymers produce tough, resilient plastics with outstanding impact strength. They pour readily and set swiftly at room temperature with negligible shrinkage.

Tools are cast to exact finish contour, minimizing hand grinding and scraping. Repairs are made quickly and at less expense. Removal of caps from obsolete dies is accomplished rapidly, safely and easily.

Write to Rezolin, Inc., 5736 West 96 St., Los Angeles, California for information on these plastic tooling compounds. For additional information on liquid polymers, write THIOKOL CHEMICAL CORPORATION, 784 North Clinton Avenue, Trenton 7, New Jersey. In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario.

(Thiokol Chemical Corporation manufactures "Thiokol" Liquid Polymer as a raw material.)

LOW VISCOSITY makes Rezolin's "Thiokol" Liquid Polymer-modified compounds easy to pour. Completed parts display outstanding resistance to solvents, oils, acids, alkalis.

FINISHED PART for Skywarrior. Parts produced by plastic tooling are also found in other Douglas planes now in production.

Thiokol®

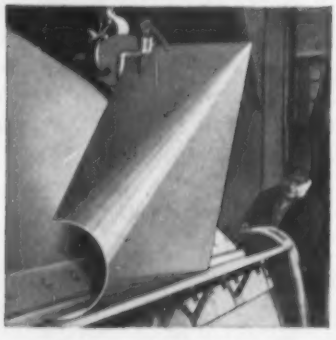
PIONEER MANUFACTURERS OF SYNTHETIC RUBBER

Bending Steel Plates for WELDMENTS?

do it economically with

CHICAGO® POWER BENDING BRAKE

(no dies needed)

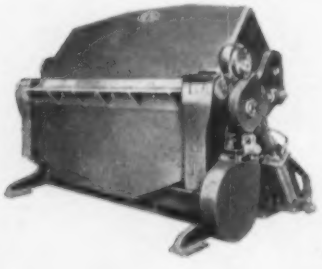


The accompanying illustrations give an idea of the versatility of the CHICAGO bending brake. No dies have to be changed or adjusted—no dies are used on these jobs. Yet, duplication is easily obtained on successive pieces. The machine is quickly adjustable for different thicknesses of material up to rated capacity. Automatic stop regulates the angle of bend. This, too, is adjustable to any degree of bend. The ease of changing from one job to another and the elimination of die costs make the CHICAGO bending brake the economical method for bending steel plates for weldments.

Many standard sizes are available with capacities for bending mild steel up to 12 feet by ¾ inch or 16 feet by ½ inch. Also many standard sizes in hand and power operated models for sheet metal.

BULLETIN P-55
This bulletin gives the details of how these and many other jobs are handled. Also complete description of the machine and specifications of the standard sizes.
Ask for a copy.

Front view of one of the heavy duty models of CHICAGO power bending brake showing the operation end of the machine.



Recommendations for any job on request.

6473

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side Presses • Press Brake Dies

Hand and Power Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.

7434 South Loomis Boulevard, Chicago 36, Illinois

tailored to meet the exact shop requirements. It must be interesting, and contain data of interest to that specific shop, not to shops in general. We will get results when we take up and streamline our shop educational programs to be of value to an individual shop, then we will begin to get results without using the whip.

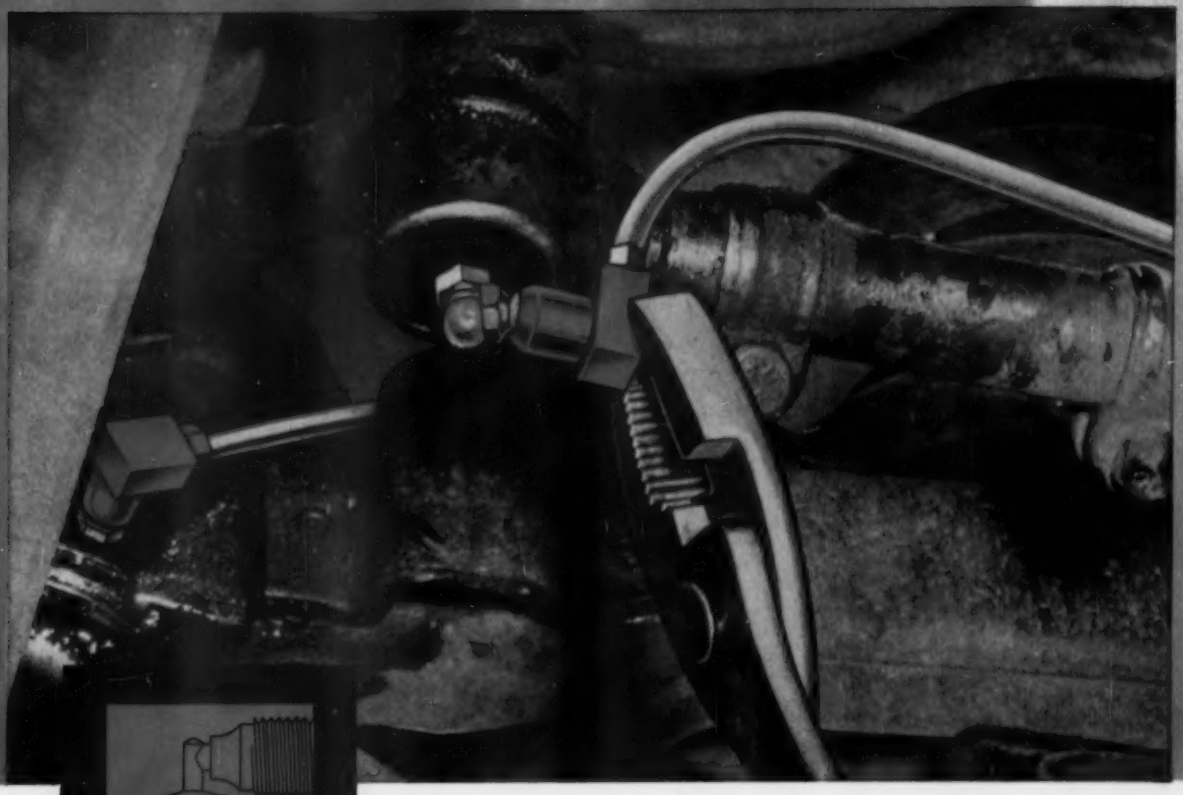
No foreman wants to sit through an hour of dry cost figures which are related to some insurance company or some large automotive productive company when his problem is a small, compact machine shop which must handle a hundred jobs within a very short time. Sure, the basic principle is all alike; so are each and every one of us alike—we are all human beings but we all have differences, and much of our individual success depends on those differences. Likewise the educational program for each department and each company must be different.

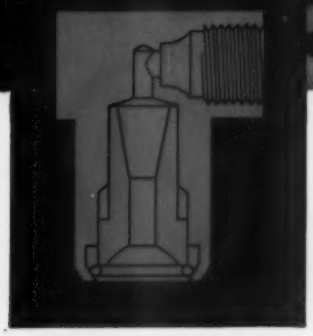
Ed should take the training program and he should get just as much out of it as he can, for any man who can know the methods used in figuring production costs is a valuable employee and one who will be reviewed and considered when advancements are pending. So many of us, including the foremen and supervisors, lose sight of the fact that it is the person who has trained assistants that gets the promotions.

In summarizing, let us state that success for our training programs depends upon getting programs properly slanted and geared to the company and its manufacturing technique. This requires the services of professional engineers who can make studies of this work and develop the proper program for the individual company.

Charles D Townsend
West Hartford, Conn

"Another breakdown, J. B.?"





Machined Aluminum Couplings Help Make Possible Push-Button Lubrication

Developed by Lincoln Engineering Company of St. Louis, the revolutionary Multi-Luber System provides automotive chassis bearing lubrication at the touch of a button on the instrument panel. For the system's couplings Lincoln found aluminum screw machine stock superior to all other metals.

A Lincoln official says, "Reynolds Aluminum has played an important part in making this system so efficient. A coupling at the terminal end of each lubricant feed line snaps over the grease fitting providing a metal-to-metal, leakproof seal. Aluminum proved to be the perfect answer for this part because it is corrosion resistant, requires no finish and is light in weight. The weight factor is particularly important because vibration over rough roads might snap a heavier coupling off the grease fitting."

The couplings are machined from ⅛" x ⅝" 2024-T4 aluminum bar stock. On a one-inch, six spindle automatic the tubular section is shaped, dimensioned internally, and cut off. On a multiple drilling machine a threaded lubricant inlet is drilled and tapped in the rectangular section.

Lightweight aluminum gives three times as much metal per pound as brass or steel . . . permits high speed machining—provides lowest total cost for material and machining.

For more information about aluminum screw machine stock for your products, call the nearest Reynolds Office or Distributor listed under "Aluminum" in classified telephone directories. Ask for brochures, "Reynolds Aluminum Screw Machine Stock" and "Aluminum Machining Data, Speeds, and Feeds." *Reynolds Metals Company, P. O. Box 1800-JJ, Louisville 1, Kentucky.*

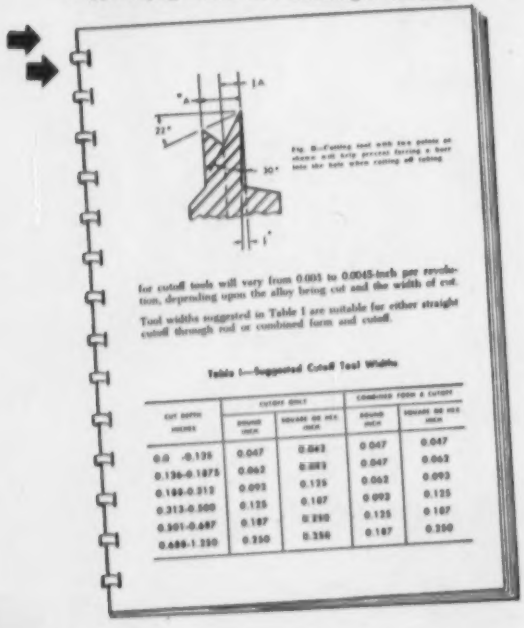
The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

Watch for Reynolds New Program, "CIRCUS BOY", Sundays on NBC-TV

FOR MORE INFORMATION SEE NEXT PAGE →

CUT MACHINING COSTS WITH ALUMINUM

A typical page from the machining handbook.



for cutoff tools will vary from 0.003 to 0.0045-inch per revolution, depending upon the alloy being cut and the width of cut.

Tool widths suggested in Table I are suitable for either straight cutoff through rod or combined form and cutoff.

Table I—Suggested Cutoff Tool Widths

CUT DEPTH INCHES	CUTOFF ONLY		COMBINED FORM & CUTOFF	
	ROUND INCH	SQUARE OR HEX INCH	ROUND INCH	SQUARE OR HEX INCH
0.0 -0.125	0.047	0.062	0.047	0.047
0.126-0.1875	0.062	0.093	0.047	0.062
0.188-0.312	0.093	0.125	0.062	0.093
0.313-0.500	0.125	0.187	0.093	0.125
0.501-0.687	0.187	0.250	0.125	0.187
0.688-1.250	0.250	0.250	0.187	0.250

THIS HANDBOOK TELLS YOU HOW

The handiest, most helpful handbook you can get on the machining of aluminum alloys is yours for the asking. This book evaluates the various aluminum alloys and recommends machining methods and tools that give maximum production economies. There is a special section on automatic screw machining. Every designer, production engineer, plant manager and machine shop superintendent needs this 124 page "Machining Aluminum Alloys" on his desk. Single copies are available without cost when requested on your letterhead. Or call your nearby Reynolds Distributor. A complete index of technical literature is also available. *Reynolds Metals Company, P. O. Box 1800-JJ, Louisville 1, Kentucky.*

Watch for Reynolds New Program, "CIRCUS BOY", Sundays on NBC-TV

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

New Books

MACHINIST READY REFERENCE—*By C Weingartner. Published by Prakken Publications, 330 Thompson St, Ann Arbor, Michigan. 121 pages, 4x6 in., wire-bound. Price $1.50.*

Reference material compiled in this handbook contains nearly 100 selected tables and charts used daily by machinists. Contents of the book range from mathematical formulas, drills, tapers, threads, milling, shaping, gears, gages and tolerances. Essentially the book provides a quick reference to metalworking data for machinists, tool designers and apprentices.

•

HUTTE—HILFSTAFELN ZUR ERMITTLUNG VON RADERUBERSETZUNGEN (HUTTE — USEFUL TABLES FOR GEAR CALCULATIONS) *Published by Wilhelm Ernst & Sohn, Hohenzollerndamm, Berlin-Wilmersdorf, Germany. 277 pages 5 x 7. Price 16.50 DM.*

For speeding up calculations involved in problems concerning gears, this book presents a series of tables. The first gives the decimal equivalent, to eight places, of all possible fractions whose denominator is equal to or less than 200. The second table gives the factors of all numbers from 4 to 20026. Table 3 is a nine-times table for all numbers between 10 and 200, and is used in connection with a quick method of performing long division.

The tables can save many hours of tiresome calculations, and a knowledge of German is not necessary for their understanding and application.

•

BEITRAG ZUR SICHERHEIT VON UMLAUFENDEN SCHLEIKOPERN (CONTRIBUTION TO THE SAFETY OF GRINDING WHEELS)—*Dr Ing Hermann Munnich. Published by Kommissionsverlag H E Ummen, Bahnhofstrasse 18, Hoxter/Weser, Germany. 272 pages, 5¼x8¼ in. Paper cover. Price DM 29.40.*

The book has all the earmarks of the doctoral dissertion it is, including a seven-page list of symbols and an extensive bibliography. No light fare,

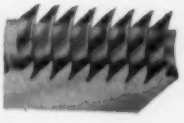
for { —greater confidence in gaging results
—continuous uniformity of production
—lower gage costs per piece inspected

get BESLY METRO GAGES

Quality-Built to
STAY ACCURATE LONGER

Micro-Lapped Finish
keeps gages accurate longer by reducing wear. No sharp "hills" and "valleys" to wear quickly and reduce gage accuracy.

Extra Clearance
at root of ring gages permits wear correction.



Truncated Thread Form

of thread plug at no extra cost. Enables accurate setting and permits easy check for gage wear.

Convolution of First Full Thread
on thread plug and ring gages removes sharp scoring edges and prevents chipping. Also makes Besly-Metro Gages easier to use.

Stress-Relieved
during manufacture by "deep-freezing" to normalize and relieve stresses and strains.

Lapped and Inspected at 68°F.
in air conditioned room which duplicates Bureau of Standards requirements.

BESLY **BESLY-WELLES** CORPORATION
Established as Charles H. Besly & Co. in 1875
120 Dearborn Avenue • South Beloit, Illinois

Insure your future—

A DRAFTING CAREER IN THE ATOMIC ENERGY FIELD

AIRCRAFT NUCLEAR PROPULSION DEPARTMENT

Here is an opportunity to join an organization that offers unlimited possibilities for job advancement and personal growth. We seek men to design and develop a nuclear reactor for the propulsion of aircraft. There may be a place for you in this dramatic and thrilling achievement! If you're a detailer, designer or a facilities design draftsman, fill out the coupon below and rush it to us at once.

GENERAL ELECTRIC

P. O. Box 132 Cincinnati 15, Ohio

Dear Mr. Cowan:
I'm interested in full details about an opportunity at General Electric as Draftsman. Please send me more information. I understand all replies are held in strictest confidence.

Mr. John Cowan, Personnel Section, A.N.P.D.
General Electric Co., P.O. Box 132,
Cincinnati 15, Ohio

Name _____

Street _____

City _____ State _____

DESIGNERS—DRAFTSMEN EXPERIENCE Check LIST

Check items listed below indicating approximate months or years of Design and Drafting experience:

	YRS.	MOS.		YRS.	MOS.
☐ Jet Engines and Components			☐ Welded Structures & Parts		
☐ Internal Combustion Engines			☐ Structural		
☐ Aircraft Power Plant Installation or Arrangements			☐ Special Purpose Machinery		
☐ Aircraft Structures			☐ Hydraulic & Pneumatic Devices		
☐ Electro-Mech-Control Actuating Mechanisms			☐ Scientific Laboratory Equipment		
☐ Electronic Mechanisms			☐ Radiation Detection & Measurement Apparatus & Instrumentation		
☐ Test Equipment, Rigs, etc.			☐ Nuclear Reactor Control Systems		
☐ Pressure Vessels			☐ Nuclear Reactor & Shields		
☐ Sheet Metal Layout			☐ Other:		
☐ Machine Parts					

Most specialized in _____

therefore, but the qualified reader is rewarded by a thorough analysis of the behavior of grinding wheels and of the causes which make them fail.

After classifying grinding wheels on the basis of the abrasive material of which they are made and the method of bonding the abrasive, the author studies the action of centrifugal force on high-speed grinding wheels and its influence on their failure; correlates his findings to the tensile strength of the wheel, which he finds to be a function of the bonding material and method of bonding; studies the effect of unbalance caused by eccentricity and varying wheel density; analyzes the various methods of mounting wheels and the effect of side disk pressure as a contributing factor in wheel failure; and rounds out the book by giving some standards and methods for testing wheel guards.

In addition to a mathematical analysis of the various causes of failure, the book contains a number of tables and many graphs, the latter being a real help in following the author's presentation and argument.

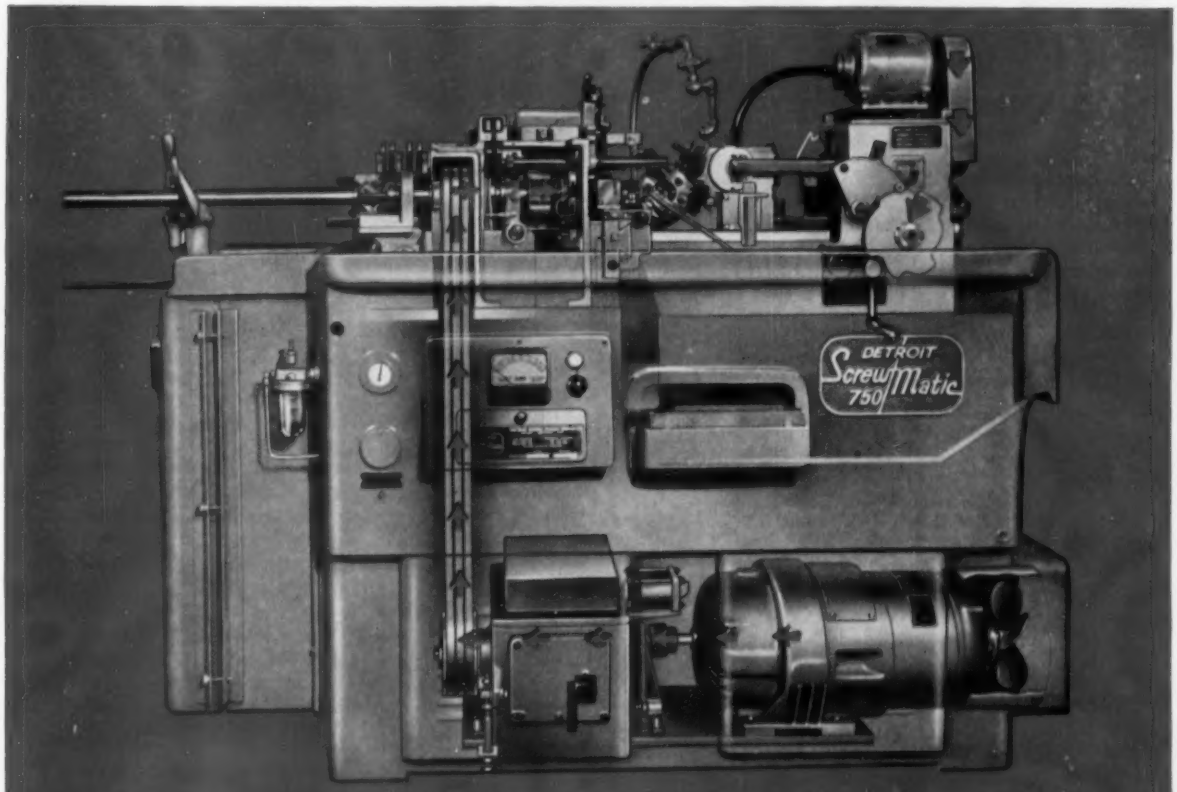
•

PRACTICAL DESCRIPTIVE GEOMETRY—*By Hiram E Gran. Published by McGraw-Hill Book Co, Inc, 330 W 42 St, New York 36, New York. 397 pages. Price $5.75.*

This Alternate Editon of Practical Descriptive Geometry attempts to correlate and integrate theory and practice instead of considering each a separate entity. The text employs the direct method because the author believes that it is the best way to solve practical problems, where the typical theoretical approach often makes solution difficult. There is a separate chapter devoted to drafting because of the extreme accuracy involved.

The entire text encompasses 925 problems, made up of 405 theoretical problems, and 520 practical problems, accompanied by 415 drawings. In this descriptive geometry textbook the transition from theory to practice is not necessarily obvious. Practical problems, because of the nature of their given information, frequently cannot be solved without considerable difficulty if an attempt is made to derive their solution by using the typical theoretical approach. This is because of the difference between factors that control the design of practical and theoretical

How Screwmatic's Modern Design Lowers Your Manufacturing Costs



SIMPLY CONSTRUCTED, yet powerful, electronic power flow system is typical of the features which make reduced costs possible. It insures long, trouble-free performance and exceptionally low maintenance costs.

LOWER COSTS—that's what you can expect from this modern, single spindle bar automatic. The modern design construction of the Detroit Screwmatic 750 gives you these cost-saving advantages:

- 3 SPINDLE SPEEDS. Infinitely variable. Can be used forward or reverse in one cycle . . . plus
- HIGHER SPINDLE SPEEDS. Up to 7250 r.p.m. These two features allow faster stock removal, prolonged tool life and use of modern cutting tools.
- GREATER ADJUSTABILITY permits simplified set-up. Does more work in first operation.
- MORE CLEARANCE provides efficient use of all standard tools.
- PRECISION DESIGN holds closer tolerances and reduces cutting time.
- GREATER FLEXIBILITY through accessible turret controls (index speeds, stroke, and double index).
- LESS DOWN TIME through unit construction.

FOR COMPLETE INFORMATION on how the Detroit Screwmatic 750 can cut costs for you—write today for 16-page catalog, just off the press.

DETROIT Screw Matic 750

A product of

THE GEAR GRINDING MACHINE COMPANY

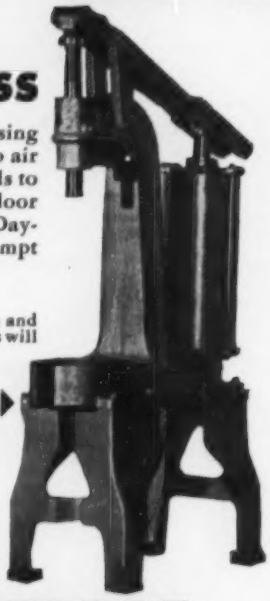
3919 Christopher • Detroit 11, Michigan

MANUFACTURERS OF: • Fully Automatic Gear Grinding Machines • Razppa (Sheppa) Constant Velocity Universal Joints

SAVE!

WITH A HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.



WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $519.

1-ton Hand-D-Press. For small parts manufacturers. Press only, without valves, $232.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

Buck AJUST-TRU **CHUCKS**

"Hold O.D. and I.D. within .001" day in and day out."

Buck Ajust-Tru chucks are ideal for precision grinding. Most recent report is from Mr. Chester Nelson, Supt. Press & Machine Div., J. I. Case Company, Bettendorf, Iowa. He writes—

"The part has been O.D. ground on a Centerless Grinder first, then the I.D. is ground by being held in the six (6) jaw Buck Chuck. The accuracy of the Buck Chuck is used to its fullest extent since the O.D. and I.D. have to be concentric within .001" total indicator runout. This tolerance is being held constantly day in and day out."

You, too, can handle precision grinding *faster* and *at less cost* with Buck Ajust-Tru chucks. Takes but a moment to send for literature—write today.

Do you use Power Chucks?

Ask for information about the new Buck standard and Compensating chucks —up to 12".

BUCK TOOL COMPANY

1010 SCHIPPERS LANE • KALAMAZOO, MICHIGAN

problems. Components of the machine or job, control the practical problem's given information, while author and teacher have complete control over the theoretical problems.

•

REFRACTORY MATERIALS FOR USE IN HIGH-TEMPERATURE AREAS OF AIRCRAFT—*By N R Thielke, Pennsylvania State University, for Wright Air Development Center. Published by Office of Technical Services, US Dep't of Commerce, Washington 25, DC. 97 pages. Price $2.50. Order No PB 121046.*

Studies of carbide, cermet, and oxide-type ceramic bodies, and an investigation of thermal shock are described in this report. It reviews investigation of fracture patterns and microstructures of TiC-cermet stator blades, and indicates the theoretical and experimental studies made on the oxidation behavior of cermets. Oxide-type ceramics were submitted to tests intended to improve the properties of aluminum titanite bodies, and a static test was derived to determine thermal stress resistance factors of five ceramic materials.

•

WELDING RODS AND ELECTRODES—*Specifications have been published by the American Welding Society, 33 West 39th St, New York 18, and The American Society for Testing Materials, 9116 Race St, Philadelphia 3, on three subjects:*

"Welding Rods and Electrodes for Welding Cast Iron"—Specification AWS A5.15; ASTM A398—covers filler metals suitable for welding gray cast iron, malleable iron and some alloy cast irons. Sixteen classifications of filler metal are covered, including cast iron, copper-base, nickel-base and mild-steel electrodes for shielded metal-arc welding. Also included are cast-iron and copper-base welding rods for oxyacetylene and carbon-arc welding. An appendix aids users to selecting the most suitable filler metal for their needs. It tells how to prepare cast iron for welding, gives information on pre-heat requirements, welding technique, etc. It also contains data on postweld heat treatments and

Pratt & Whitney's J-57 Turbojet: The most powerful aircraft production engine in the world is rated in the 10,000-pound thrust class.

Why Pratt & Whitney Uses 19 Gear Grind Machines to Guarantee Performance in the World's Most Powerful Aircraft Production Engine

At Pratt & Whitney Aircraft, where finest quality gears and high production are essential to the manufacture of the J-57 Turbojet, 19 new automatic Gear Grind Machines are in daily use. Here is what Pratt & Whitney has to say:

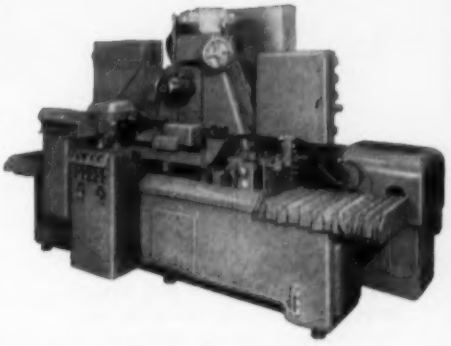
"The new Gear Grind Machines presently used in the aircraft engine division are the first major development in this type of machine since their use at Pratt & Whitney. They were developed in cooperation with Pratt & Whitney engineers to meet the specific and exacting requirements of modern aircraft engine gears. These machines are equipped with a new wheel-trimming feature and a two-speed spindle drive to eliminate burning.

"Another advantage is the relative ease with which the involute profile can be modified."

YOU'LL WANT TO KNOW MORE ABOUT THESE ADDITIONAL ADVANTAGES FOUND IN THE NEW GEAR GRIND AUTOMATICS

- Controlled flow of coolant through the grinding wheel insures non-tempered, case-hardened gears.
- Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet.
- Automatic trimming of the grinding wheel assures uniformly accurate work.
- Available as fully automatic machines incorporating automatic loading and unloading.

Write today for comprehensive eight-page brochure which explains the details.



For gears up to 36" diameter.

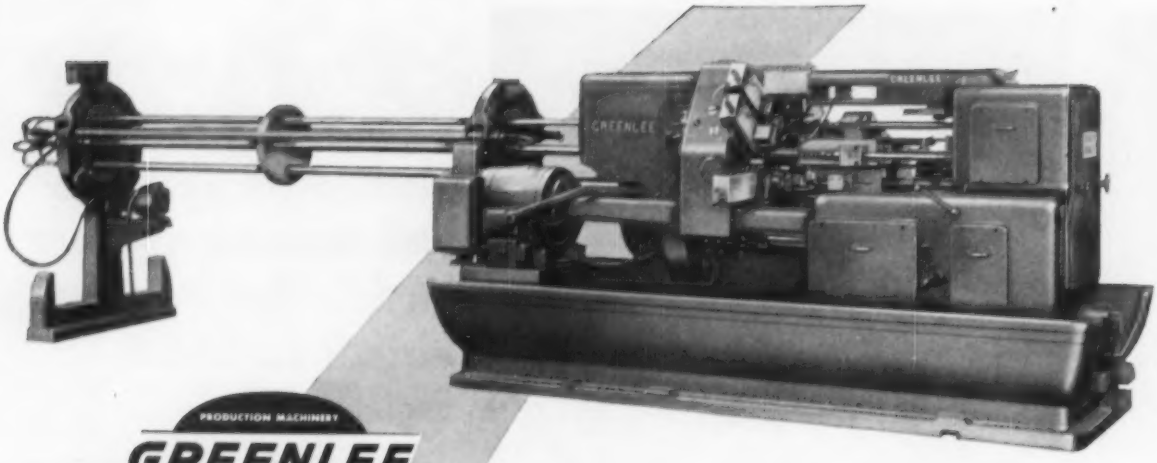
The Gear Grinding Machine Company

56-B

3919 Christopher, Detroit 11, Mich.

Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machines. RZEPPA ("Sheppa") Constant Velocity Universal Joints



PRODUCTION MACHINERY

GREENLEE

AIR-FEED AUTOMATIC

- 1 Permits Greater Job Versatility
- 2 Easily Adapted to Multiple Feedouts
- 3 Provides Longer Stock Feedout
- 4 Eliminates Stock Scoring
- 5 Reduces Stock Reel Noise
- 6 Eliminates Stock Pushers
- 7 Eliminates Feedout Cams

Write today for Catalog A-405, or better still, have the Greenlee man call and show you the way to more profitable production with this air-feed automatic bar machine.

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

GREENLEE BROS. & CO.

PRODUCTION MACHINERY

GREENLEE

1740 MASON AVE.

Rockford, Illinois

describes the effects of welding on cast iron. Price, 40 cents.

"Nickel and Nickel-Base Alloy Bare Filler Metals"—Specification AWS A5.14; ASTM B304—establishes 13 classifications of filler metal. This involves, among others, nickel, Monel, K Monel, Inconel, Inconel X, as well as various Hastelloy filler metals, for welding nickel and high nickel alloys. Price, 40 cents.

"Hard Surfacing Welding Rods and Electrodes" — Specifications AWS A5.13; ASTM A399—covers 45 classifications of filler metal. This involves the high-speed steels, austenitic manganese steels, austenitic high-chromium irons, cobalt-base filler metals, copper-base and nickel-chromium-boron filler metals. Price, 40 cents.

These new standards are available from either society.

•

NOMOGRAPHISCHES RECHNEN (NOMOGRAPHIC CALCULATIONS) — *By Dipl-Ing Fritz Kiessler. Published by Verlag W Girardet, Essen, Germany. Paper cover. 190 pages. Price DM 9.80.*

An introduction to nomography that requires a minimum of previous training in mathematics, the book is designed for students and for self-teaching of shop men. It shows the advantages to be derived from the use of nomograms, the way the various types of nomograms are used, and methods of constructing nomograms for specific applications.

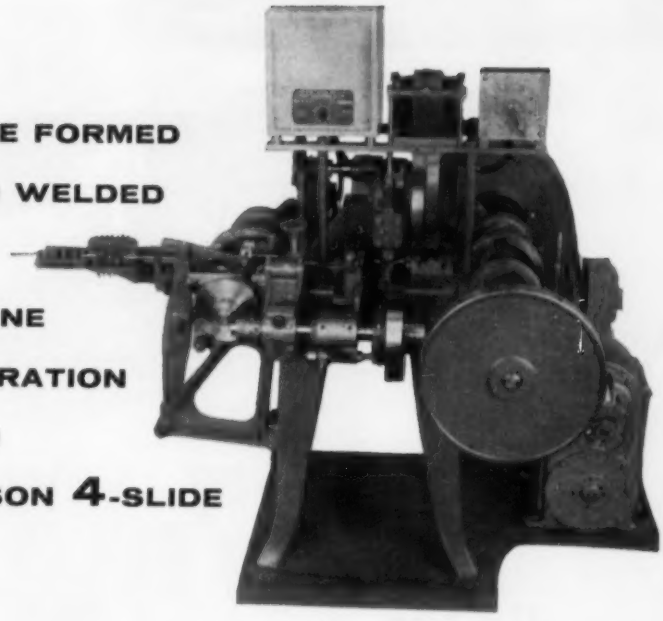
Beginning with the relationship between two variables, the reader is brought to the graphical representation of their relationship and the coordinate system.

Progress is gradual: the student is introduced to quadratic and logarithmic scales only at the end of the first section of the book, after a thorough drill in arithmetic scales.

The second section deals with the relationship between three variables, and the third with relationship between more than three.

Geometric construction of nomograms is stressed throughout. While emphasis is placed on alignment charts, the construction of other types of graphical solutions is explained, especially where the alignment chart would be difficult to construct.

WIRE FORMED AND WELDED IN ONE OPERATION WITH NILSON 4-SLIDE



Garter loop formed and welded in one fast operation by Nilson 4-Slide.

Production is increased more than 25% by Hawie Manufacturing Company using a #1 Nilson 4-Slide with welding attachment which eliminates need for ferrule loops in the manufacture of hose supporters. .062 soft basic wire is formed with ends welded in one automatic operation at a conservative 105 pieces per minute. Additional savings are realized in eliminating cost of ferrule.

Another example — Drapery hook is formed with two wires entering 4-Slide simultaneously and automatically welded together at point of contact.

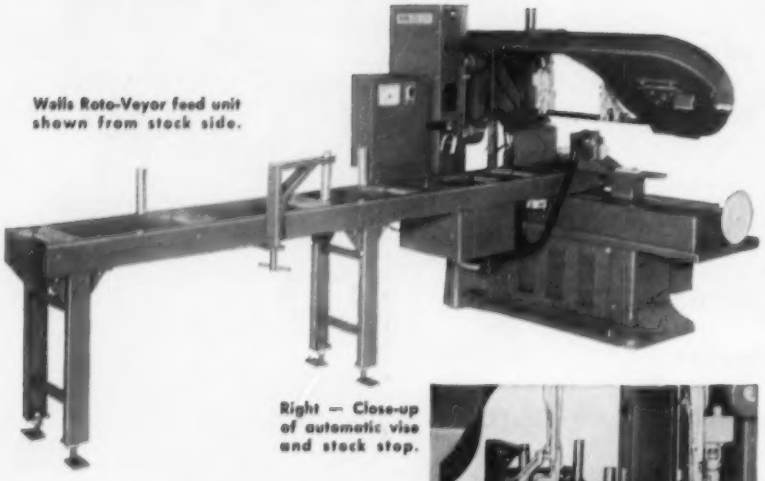
Nilson 4-Slides will produce many types of wire forms similar to the part shown here in which two pieces must be welded or otherwise closed together. By the mounting of automatic welding equipment on the 4-Slide, such parts can be produced in one fast, accurate operation at minimum cost. Nilson 4-Slide Wire Forming Machines are available in a wide range of sizes to handle basic steel wire from 1/32" to 1/2" diameter.

A.H. NILSON MACHINE COMPANY

1519 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

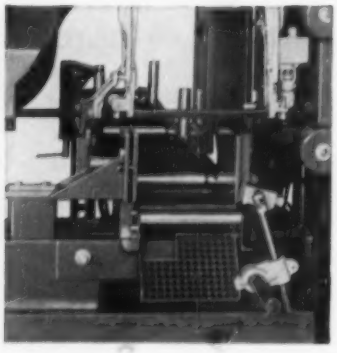
Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

Different • Practical • Efficient



Wells Roto-Veyor feed unit shown from stock side.

Right — Close-up of automatic vise and stock stop.



The New *Wells Roto-Veyor* AUTOMATIC BAR FEED

DESIGN FEATURES

- Heavy duty construction—enclosed steel channel side rails. Welded leg sections—adjustable feet for leveling, drilled for anchoring.
- Manual control (forward-reverse) switch for fast, convenient job set-up, or stock removal.
- All conveyor feed rollers are mechanically powered—electrically controlled.
- Unlimited projection length.
- Automatic work vise, hydraulically actuated.
- Positive stock stop, hydraulically operated, swings out of way during cutting operation.
- Extension conveyor sections, available in 10 ft. multiples, powered by basic unit feed drive.

The Wells Roto-Veyor is an entirely new concept in automatic bar feeds. Designed specifically for use with the Wells Model 1200 Band Saw, the Roto-Veyor converts it into a heavy duty completely automatic cut-off machine.

The Roto-Veyor feed mechanism and stock clamping action is synchronized with the saw to provide accurate repetitive cutting. It improves the saw's efficiency, saves time, and reduces production cutting costs.

SPECIFICATIONS

Capacity:	
Rectangular	12" x 12"
Rounds	12¾" O.D.
Maximum length of multiple cuts	Unlimited
Projects within 7" end of stock	
Height, floor to conveyor	28"
Overall height of feed unit only	46½"
Floor area in addition to saw	88" x 24"
Shipping weight, approximate	705 lbs.

Let us send you complete information — write today.

Wells Saws

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 Roosevelt Rd. Three Rivers, Mich.

Names in the News . . .

Archie N Colby has joined Greer Hydraulics, Inc, Jamaica, NY, as general sales manager. He was formerly associated with Bruce Payne & Associates, Westport, Conn.

Arthur B Goetze, vice president, manufacturing, of Western Electric Co, has been elected president of the company. He succeeds **Fred R Kappel,** named president of American Telephone & Telegraph.

Bruce Krasberg, president of R Krasberg & Sons Mfg Co, Chicago, has been elected head of the Pressed Metal Institute. First vice president is **Clint Stryker,** head of Maysteel Products Inc, of Milwaukee and Mayville, Wis. **Carter C Higgins,** president of Worcester Pressed Steel Co, Worcester, Mass, is second vice president.

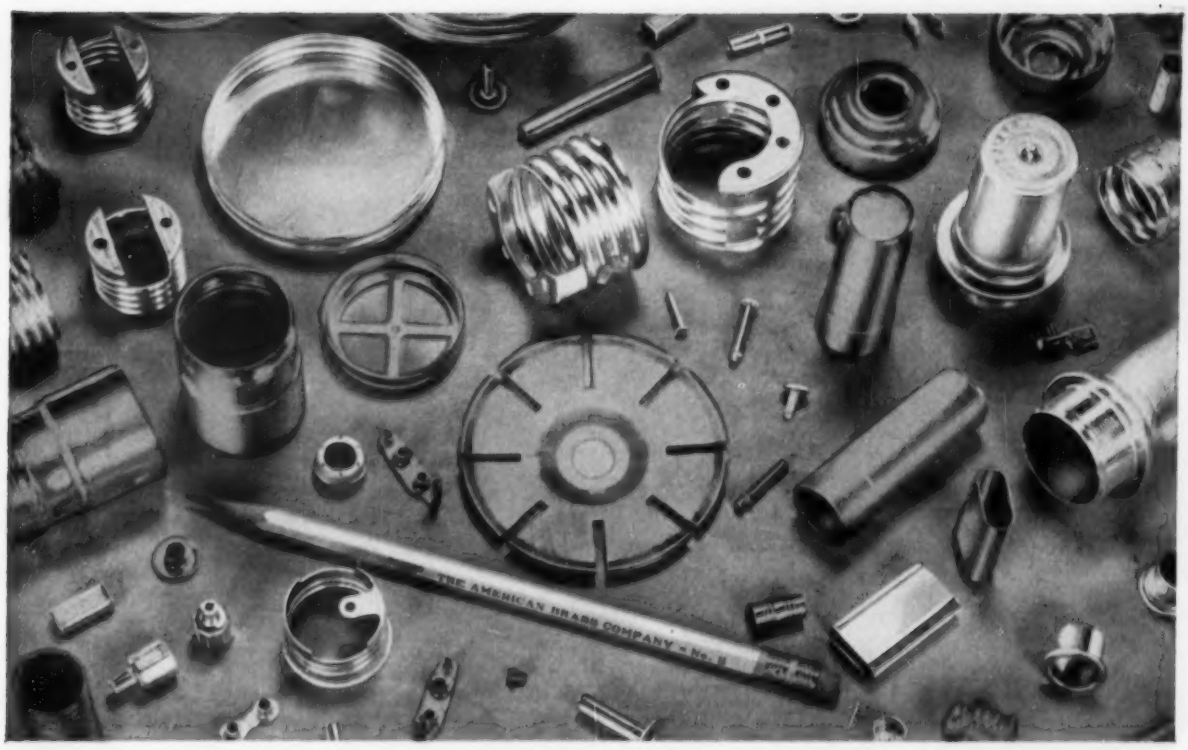
L F Van Nortwick, formerly truck sales manager of Chrysler Corp's Dodge Division, has been appointed general sales manager of the Frostrode Division of Progressive Welder Sales Co's Warren Alloy Division. Additional appointments: Bernie Walker, master mechanic, to assistant director of manufacturing of all divisions; **Earl R Stiefel,** director of purchases; **George W Enk,** general sales manager for US and Canadian operations; **E J Formhals,** general manager of the Canadian plant at Chatham, Ont.

Edward C Peterson has been elected vice president of the Rolling Mill Equipment Division at Birdsboro Steel Foundry & Machine Co, Birdsboro, Penna. He was formerly assistant to the vice president, engineering.

Dick M Landis has been appointed assistant general manager of the De Laval Pacific Co. He was formerly manager of the Marine Division.

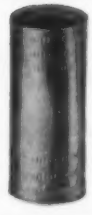
Eddie Hiler has been promoted to the post of assistant manufacturing manager of Temco Aircraft Corp's Dallas, Texas, plant. He has been serving as superintendent of nine departments at the plant.

Walter Nollenberger, chief manufacturing engineer of Square D Co's Distribution Equipment Division, has been named manager of the company's new manufacturing plant to be built in Lexington, Ky.



Why should you use valuable floor space to make parts like these?

FERRULES
for desk and chair legs, pipes, tool handles, cutlery handles and pencils, etc.



EYELETS
for all types of industrial fastening applications

GROMMETS AND WASHERS
standard sizes in stock for canvas and fabric hardware and other uses

STAMPED PARTS
of every description, including washers of heavy or light metal

SCREW SHELLS
for lamps, tubes, all electrical applications

DEEP DRAWN PARTS
cups and shells of all types, finished or unfinished

The American Brass Company has specialized equipment, such as high-speed multiple-plunger presses, for the economical production of parts like these for industry. It has thousands of stock tools which may save costly tool charges—tools and techniques developed over a century of service to manufacturers.

Your choice of metal: Parts like these can be furnished in copper, brass, bronze, nickel silver, nickel, iron, stainless steel, steel, and aluminum—in a wide variety of finishes.

Standard products: For a selection of more than 1000 eyelets of common sizes and styles, as well as eyelets kept in stock, write for Catalog BG-1.

Special products: Just send a sample, drawing, or description, together with quantity and other pertinent information. Address: The American Brass Company, Fabricated Metal Goods Division, Waterbury 20, Conn. 5883 (Rev.)

ANACONDA® MULTIPLE-PLUNGER PRESS PRODUCTS

One Pound of Metal Removed Per Minute

Two HAYNES STELLITE alloy tools remove 118 cubic inches of metal from rough, uneven nickel-chromium billets in 20 minutes. They trim 1½ in. from the diameter in one pass, and finish two of the 170-lb. billets per grind. Each tool removes about a pound of metal per minute in spite of the irregularity of the billet. Cutting speed is 37 surface ft. per minute and the rate of feed is ⅝ in. per minute. Heat generated during the cutting operation quickly dulled the cutting edges of high-speed steel tools tried on this job, and the rough cut caused other tool materials to chip. Only HAYNES STELLITE 98M2 cobalt-base alloy tools proved to be both hard and tough enough to do the job efficiently.

HAYNES STELLITE alloy tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they take deep cuts.

More information on HAYNES STELLITE tools and how they can be used to best advantage is contained in the booklet, "HAYNES STELLITE Metal-Cutting Tools." Write any of the district offices listed below for your copy.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

Recommended for your

BUSINESS BOOKSHELF

AFL-CIO: Labor United

An authoritative account of the events leading up to the merger of AFL and CIO. Analyzes possible influences of this powerful new force upon 18 million union members, their families, communities, employers, and the nation as a whole. By A. J. Goldberg, special counsel of the AFL-CIO. **319 pages, $5.00**

New Frontiers for Professional Managers

Here are the views of an outstanding business leader on the problems facing large corporations and their managers in today's expanding economy. **Ralph J. Cordiner,** President of General Electric, tells what this company did about these problems, the philosophy of responsible decentralization they are following, how it is being implemented, and what it means to professional managers. **121 pages, $2.75**

Psychology in Management

Here is a stimulating, easy-to-read book that shows you how to apply the principles of psychology to specific human relations problems you face in supervising the people who work for you. Written by a leading industrial psychologist, it gives you greater insight into the forces that motivate good working habits as well as those that result in dissatisfied and inefficient workers. **By Mason Haire. 201 pages, illustrated, $4.75**

Communication: Handling Ideas Effectively

Helps you improve ability in the important executive quality of skill in absorbing and communicating ideas. Gives a related treatment of reading, writing, speaking, listening, and observing as 5 keys to better communication. Includes helps on report writing and discussion leadership. **By R. I. Johnson, M. Schalekamp and L. A. Garrison. 450 pages, $4.50**

10 DAYS' FREE EXAMINATION

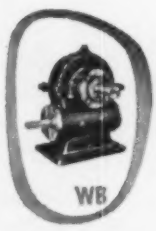
McGRAW-HILL BOOK CO., INC., Dept. AM-11-5
327 W. 41st St., N.Y.C. 36

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with this coupon—same return privilege.)

- ☐ Goldberg—**AFL-CIO: Labor United, $5.00**
- ☐ Cordiner—**New Frontiers, $2.75**
- ☐ Haire—**Psychology in Management, $4.75**
- ☐ Johnson et al—**Communication, $4.50**

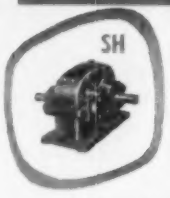
(PRINT)
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position .....

For price and terms outside U.S., write McGraw-Hill Int'l., N.Y.C. AM-11-5



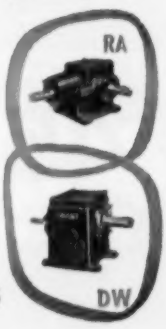
Grant Speed Reducers

YOUR ASSURANCE OF BETTER PERFORMANCE



The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.



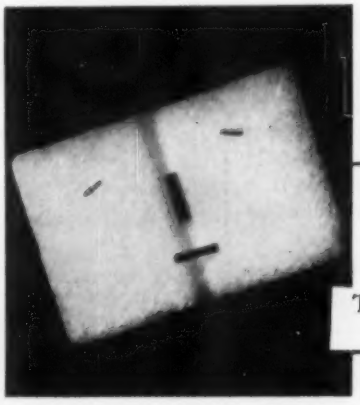
Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

STOCK GEARS SPECIAL GEARS
SPEED REDUCERS

GRANT GEAR WORKS INC.

Founded in 1877 by George B. Grant, the Pioneer Gear Man

149 WEST SECOND STREET BOSTON 27, MASS.



WORRIED ABOUT PRECISION PIVOTS?

Call VK

Steel, chromium plated, or carbide precision pivots to .015" diameter. 1 RMS or finer surface finish. Diameter tolerances to .000010". Chamfers, radii, lapped ends, etc.

Also volume production lapping of flat or round production parts.

Submit your specifications

THE VAN KEUREN COMPANY
176C WALTHAM STREET
WATERTOWN, MASS.

The pencilgrapher's nightmare at the left consists of a lump of sugar and four VK Precision Parts. The "eyes" are .080" long.

Maintenance Problems Licked

at new low cost

VAPOR MODEL 45 UPGRADER JR. STEAM CLEANER

the most economical unit on the market!

low, low initial cost . . . only $359 f.o.b. factory

low, low operating cost . . . uses half as much fuel.

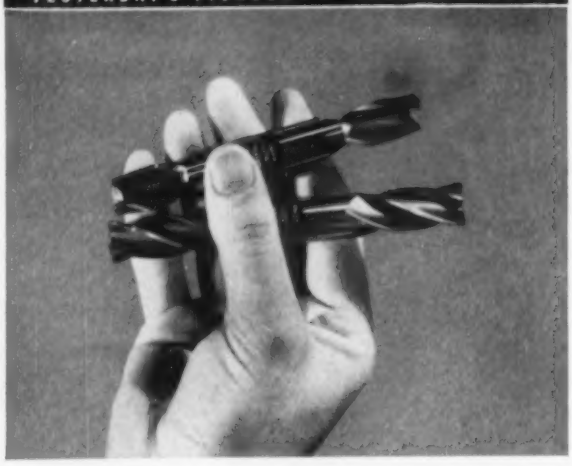
Outperforms big, costly machines where a handy steam cleaner is needed. Pressure impact of hot cleaning solution penetrates smallest cracks and crevices. Permanent mount or (optional at small additional cost) portable on rubber tire wheels.

cleans, sterilizes, disinfects, heats, sprays . . . practically anything!

Vapor Heating Corporation
80 East Jackson Boulevard, Chicago 4, Illinois, Dept. K-11
Send me bulletin No. 442 containing full details about the new Vapor "45" Steam Cleaner.

Name_____ Position_____
Company_____
Address_____
City_____ State_____

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON

Double-End End Mills

FOR DOUBLE DUTY

Weldon Double-End End Mills originally developed by Weldon give you double the service for much less than the cost of two single end mills of equal size. They save production time, too, because to change the mill you simply turn it end for end.

Weldon leadership in the cutting tool field has been achieved by many original features which contribute to faster, better performance and longer tool life.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

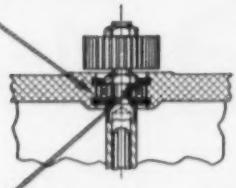
3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

4 Waldes Truarc Rings Cut Costs Drastically, Increase Versatility of Precision Automatic Drill

Dumore's New Automatic Drill

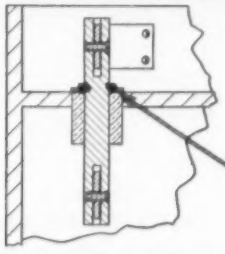
Dumore Precision Tools, Racine, Wisconsin, uses 4 Waldes Truarc Retaining Rings in their versatile new automatic drill unit. Machining operations have been eliminated, assembly simplified. Great labor savings have resulted from use of Truarc rings.

Drive Spindle Assembly



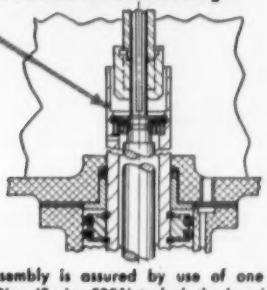
Bearing is held in position by two Waldes Truarc Rings—Standard (Series 5000) and Bowed (Series 5001). Two grooves are turned and housing rough bored in one operation. Alternate method would require at least two additional machining operations. Bowed Truarc ring takes up accumulated tolerances resiliently.

Actuator Lever Shaft Assembly



A Single Waldes Truarc External Retaining Ring (Series 5100) acts as shoulder, holds the lever in position. Labor savings are tremendous—a simple groove cutting operation replaces turning a shoulder, grinding and polishing.

Piston Assembly



Easy assembly is assured by use of one Waldes Truarc Bowed Ring (Series 5001) to lock the bearing to the piston assembly. When unit is to be used in tapping applications, entire spindle assembly can be removed without disassembly.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

WALDES
TRUARC®
RETAINING RINGS

Send for new catalog supplement

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

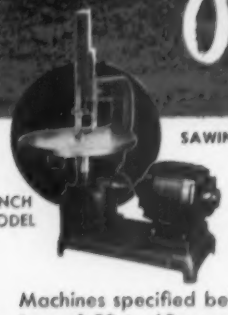
Name _____
Title _____
Company _____
Business Address _____
City _____ *Zone* ___ *State* _____

AM 110

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,428; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,083; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

OUTSTANDING!

SAWING, FILING AND LAPPING OPERATIONS ARE BEST PERFORMED



BENCH MODEL

ON

Oliver DIE MAKING MACHINES

Machines specified below will produce cost savings of 50 to 60 percent on expensive dies and gages. Over 40 years of experience has resulted in the production of the finest equipment available today.

SPECIFICATIONS			
	S-4 Bench Model*	S-1 Bench Model*	Heavy Duty Model
Capacity	Saws to center of 17" circle on steel up to 1" thick	Saws to center of 17" circle on steel up to 1" thick	Saws to center of 20" circle on steel up to 3" thick
Table	11¼" dia.	11¼" dia.	18" dia.
Tilt	10° to right, left or front	10° to right, left or front	15° to right, left or front
Strokes per minute	313 & 428	400	100, 125, 175, 215, 250 & 300
Length of stroke	1⅛"	1⅛"	0" to 5"
Drive	V-belt	Direct	V-belt

*Also available in pedestal models.

For proof of the economies produced by these machines please write for additional information.

HEAVY DUTY MODEL

Oliver INSTRUMENT • COMPANY

1414 EAST MAUMEE — OLIVER ADRIAN — ADRIAN, MICHIGAN

FACE MILL GRINDERS • AUTOMATIC DRILL GRINDERS • DIE MAKING MACHINES
TOOL & CUTTER GRINDERS • DRILL POINT THINNERS • TEMPLATE TOOL GRINDERS

NEED PRODUCTION ENGINEERS . . . EXECUTIVES?

A quick solution to this problem can be obtained through an employment advertisement in our classified advertising section.

American Machinist's readership is confined to just the type of men you need. . . . Waste circulation is avoided. . . . You reach only the men you need.

Classified Advertising Division

American Machinist

330 West 42nd Street — **New York 36, N.Y.**

Books Serve as Tools

Today's production needs have put the spotlight on rapid technical developments in machines, materials, processes, and management. New demands for know-how and skill face your personnel—from top engineering design right down through the many levels of supervision and mechanical shop work. Make sure you get the maximum in efficiency and production from your whole staff—give them the advantages of the technical training and upgrading afforded by McGraw-Hill Books.

THE NEW AMERICAN MACHINIST'S HANDBOOK

Covers every major phase of machine shop and drawing room practice in 45 detailed sections. Answers thousands of questions on layouts, feeds, speeds, tools, jigs, fixtures materials, standards, tolerances, etc. **Edited by R Le Grand, Senior Assoc. Ed., American Machinist.** Based on earlier editions of Amer. Mach. Hndbk. by Colvin & Stanley. **1579 pp., 774 illus., $11.00**

DIE DESIGN HANDBOOK

Cut design work in HALF on many jobs! This practical guide not only shows how to make better, more efficient designs, but also presents hundreds of actual, proven die designs for cold pressworking of sheet or strip metal. Provides a wealth of data on such subjects as design of stampings, die sets and components, press feeding and unloading equipment, die and stamping materials, etc. **By ASTE, F. W. Wilson, Editor-in-Chief. 768 pp., 695 illus., $14.50**

HANDBOOK OF FASTENING AND JOINING OF METAL PARTS

Time-saving shortcuts and quick solutions to fastening and joining problems. Covers screw threads, welding, collars, couplings, keys, brazing, adhesives, etc. A 200-page section in picture-caption style gives practical answers to fastening and joining sheets, rods, tubes, and much more. **By V. H. Laughner, Ed., Modern Materials Handling, and A. D. Hargan, Formerly Supervising Design Engineer, Bell Telephone Labs. 622 pp., over 3500 illus., $15.00**

MATERIALS HANDBOOK

Presents the most important facts relating to over 10,000 materials. Helps executives, engineers, purchasing agents, and others make comparisons, avoid checking many sources, and get a quick, working knowledge of materials best suited to a particular purpose. Eighth Edition gives details on new electronic materials, heat-resistant alloys, and other advances in materials. **By George S. Brady. 8th Ed. 1018 pp., $11.00**

THE FOREMAN'S HANDBOOK

Gives methods, data, principles, and background information used by successful foremen to make the most of their jobs. Here 24 experts present facts on all phases of a foreman's functions—from handling people and production to understanding management fundamentals. Third Edition covers developments in quality control, wage plans, etc. **Edited by Carl Heyel, Management Engineer. 3rd Ed. 577 pp., 84 illus., $6.50**

SEE THESE BOOKS 10 DAYS FREE

McGRAW-HILL BOOK CO., Dept. FA-11-5-56
327 W. 41st St., N. Y. 36, N. Y.

Send me book(s) checked below for 10 days' examination on approval. In 10 days, I will remit for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with coupon; same return privilege.)

- ☐ Le Grand—**New Amer. Mach. Handbk.**—$11.00
- ☐ ASTE—**Die Design Handbk.**—$14.50
- ☐ Laughner & Hargan—**Handbk. of Fast.**—$15.00
- ☐ Brady—**Materials Handbk.**—$11.00
- ☐ Heyel—**Foreman's Handbk.**—$6.50

PRINT
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position .....
For price and terms outside U. S., write McGraw-Hill Int'l., N. Y. C. FA-11-5-56

Photo Courtesy of Z & W Machine Products, Inc.

Quality Control

BUILDS INCREASED MACHINABILITY INTO YOUNGSTOWN COLD FINISHED BARS

Leading producers of thousands of high-quality screw machine products have made Youngstown Cold Finished Bars their regular specification for long trouble-free production runs. That's because they're quality-controlled throughout all production phases from ore mine to cold finishing.

They possess the best chemical composition, physical structure and surface conditioning—a result of Youngstown's half-century of steelmaking know-how. For improved machine finishes and increased tool life at greatly increased machining speeds, always specify Youngstown—your best assurance of quality and product uniformity.

For additional help or information call our nearest District Sales Office today—or write directly to our Home Office.

QUALITY YOUNGSTOWN SERVICE

COLD FINISHED BARS

Youngstown
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

CIRCLE R
helps
Machine Builders
back their
Production Claims

You can design a masterly machine for either automation or regular production. But you cannot guarantee that it will operate to full capacity unless its metal-cutting components are wholly reliable. Circle R saws and other circular metal-cutting tools are the best you can buy, yet cost no more. Performance records prove that they ensure longer runs, less down time, consistent precision. We are prepared to advise you on selection of Circle R tools to bring out the full capabilities of your products. Ask for Catalog N.

We advise on special requirements for automation

Consult CIRCLE R Specialists in —

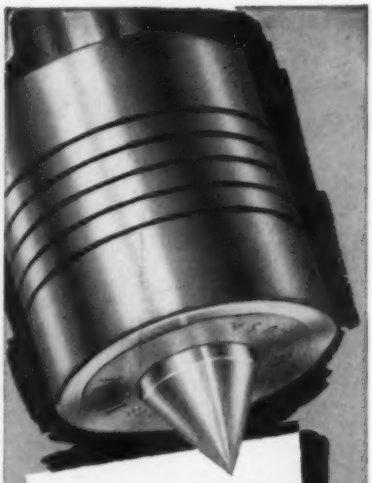
Burbank · Chicago · Cleveland · Dayton · Detroit · Hackensack · Indianapolis · Kansas City · Milwaukee · New York City · Philadelphia · Montreal · Phoenix · Pittsburgh · Providence · Rochester · St. Louis · Westbury, L. I.

METAL SLITTING SAWS · COPPER SLITTING SAWS · SCREW SLOTTING SAWS · COMMUTATOR SLOTTING SAWS · JEWELERS SLOTTING SAWS · CUT OFF SAWS · CIRCULAR KNIVES & ROTARY SHEAR BLADES · CIRCOLOY STEEL SAWS · SOLID & TIPPED TUNGSTEN CARBIDE SAWS · COMBINED DRILLS & COUNTERSINKS · CENTER REAMERS

CIRCULAR TOOL CO., INC.

PROVIDENCE 5, RHODE ISLAND

Specialists in Circular Cutting Tools Since 1923



best for your jobs!

easiest to get!

IDEAL

LIVE CENTERS

Guaranteed to match the accuracy of your lathes

IDEAL'S simplified ordering plan ends tool room headaches. Get exactly the live center you need when you need it — right from distributor stocks. Widest range of models, sizes and capacities — all precision-built for continuous close tolerances.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

In Canada: Irving Smith, Ltd., Montreal

GET CATALOG DATA

IDEAL INDUSTRIES, Inc. (IDEAL)
1057 Park Ave., Sycamore, Illinois

Please send us data on IDEAL'S complete line of LIVE CENTERS.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

LASSY TAPPERS

Now exclusive features and top quality make Lassy Tappers outstandingly the finest available, for the tool room—small lot production—and the problem jobs. A low priced investment that soon pays for itself. Write for illustrated circular showing 5 models, and also Universal Tap and Die Guide.

LASSY TOOL CO. Plainville, Conn.

A Handbook of WORKHOLDING DEVICES

Part I of a new 2-part *American Machinist* Special Report, dealing thoroughly with the many devices for holding work machined during *rotation*. Sixteen pages, fully illustrated, 25 cents per copy.

READER SERVICE DEPARTMENT

American Machinist
McGraw-Hill Building
New York 36, N. Y.

A "natural" for aircraft parts

New! Revolutionary!

Colonial ONE-WAY Surface Broacher

"Eliminates" Return-Stroke
"Eliminates" End of Stroke
"Doubles" Length of Stroke

For complete information on the new Colonial ONE-WAY surface broacher, ask for Bulletin VC-55

MECHANICAL DRIVE AC MOTOR

VARIABLE SPEED

HYDRAULIC OR MECHANICAL FIXTURES

CARBIDE OR HSS BROACHES

NO PIT REQUIRED FOR LOW CEILING

LONGER TOOL LIFE

EXTREME ACCURACY GUARANTEED

STROKE LENGTH UP TO 200 INCHES

SPEEDS UP TO 50 FEET/MIN.

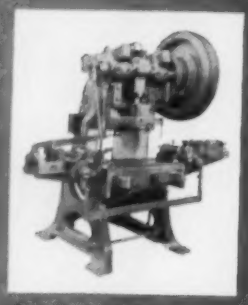
ONE LONG STROKE— ONE PART OR MULTIPLE SHORT STROKES ON MULTIPLE PARTS

CONTINUOUS OPERATION

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH & MACHINE CO. DETROIT 13, MICH.

UNIFIED BROACHING is the key to successful broaching

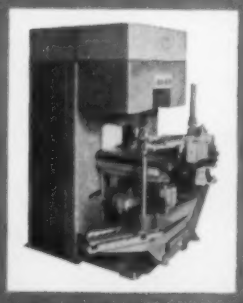
Which one is best?



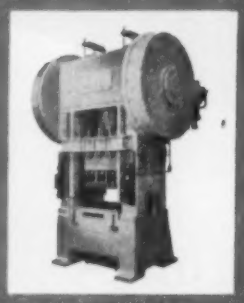
INCLINABLE . . .

Talk to the man

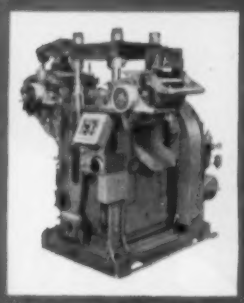
Presses and methods that automatically reduce costs



NOTCHING MACHINE . . .



STRAIGHT SIDE . . .



DIEING MACHINE . . .

who sells ALL four

YOUR HENRY & WRIGHT - V & O PRESS REPRESENTATIVE

Yes, now you can discuss the advantages of the basic types of mechanical presses with an unbiased expert. We mean a man who sells all four (and thus has no axe to grind), knows the performance of each press and can help match objectively the requirements of your production with the press that's best for you.

Behind each of these men are two engineering organizations geared to help work out problems ranging from simple blanking to automated "packaged" presses. Your Henry & Wright – V & O Press representative will fit into your production planning team like the "pro" he is – adding his experience to yours in appraising press performance *in terms of your requirements.*

Our representative is as near to you as your telephone. The names and addresses of the companies representing us are listed on the right. Don't miss calling in these experts on any press replacement or modernization program.

EMHART MFG. CO. PRESS DIVISIONS

HENRY & WRIGHT
HARTFORD, CONNECTICUT

THE V & O PRESS CO.
HUDSON, NEW YORK

PHONE, WRITE OR WIRE THE H&W-V&O REP NEAREST YOU

BOSTON, MASS.
Rudel Machinery Co., Inc.
Statler Bldg.

BUFFALO, N. Y.
Rudel Machinery Co., Inc.
1807 Elmwood Ave.

CHICAGO, ILL.
Bryant Machinery & Engineering Co.
640 W. Washington Blvd.

CINCINNATI, OHIO
The Motch & Merryweather Machinery Co.
First National Bank Bldg.

CLEVELAND, OHIO
The Motch & Merryweather Machinery Co.
1213 West Third St.
Penton Bldg.

DAYTON, OHIO
The Motch & Merryweather Machinery Co.
1305 American Bldg.

FERNDALE, MICH.
The Motch & Merryweather Machinery Co.
23520 Woodward Ave.

INDIANAPOLIS, IND.
C. C. Garrett Machinery
6060 College Ave.

KANSAS CITY, MO.
Bryant Machinery & Engineering Co.
c/o Fuchs Machinery & Supply Co.
1823 Walnut St.

LOS ANGELES, CALIF.
Harron, Rickard & McCone Co. of Southern California
3850 South Santa Fe Ave.

MILWAUKEE, WISC.
Bryant Machinery & Engineering Co.
647 W. Virginia St.

MINNEAPOLIS, MINN.
Bryant Machinery & Engineering Co.
225 South 5th St.

MUSKEGON, MICH.
Bryant Machinery & Engineering Co.
c/o Lakeshore Machinery & Supply Co.
400 W. Laketon Ave.

NEW YORK, N. Y.
Rudel Machinery Co., Inc.
100 E. 42nd St.

OMAHA, NEB.
Bryant Machinery & Engineering Co.
c/o Fuchs Machinery & Supply Co.
521 S. 15th St.

PITTSBURGH, PA.
The Motch & Merryweather Machinery Co.
Clark Bldg.
717 Liberty Ave.

SAN FRANCISCO, CALIF.
Harron, Rickard & McCone Co. of Northern California
2070 Bryant St.

SYRACUSE, N. Y.
Rudel Machinery Co., Inc.
212 Larned Bldg.

WEST HARTFORD, CONN.
Rudel Machinery Co., Inc.
7 South Main St.

Modified BAY STATE thread grinding wheel grooves the inner race of tiny ball bearing. Photo courtesy of Miniature Precision Bearings, Inc. at Keene, N.H.

Behind Controlled Flight . . . BAY STATE GRINDING WHEEL PRECISION!

Of tremendous importance to the effectiveness of guided missiles, jet planes, and other supersonic projectiles, is the *precise control* of their flight. The tiny instruments which give this control need unbelievably small bearings which must perform perfectly. One such ball bearing is shown full size on the page opposite.

Grinding such perfection into each ball-groove and face of these gem-like bearings demands grinding wheels with the most *dependable* uniformity of cutting action . . . in wheels down to the midgets which do their work *inside* the miniature bearings!

Electronic Formulation, the exclusive BAY STATE control which gives such complete grinding wheel uniformity, is one of the answers to this and many other grinding problems. "EF" uses the unerring accuracy of electronic computers to calculate precise amounts of each grinding wheel ingredient, and to "remember" these amounts on electronically punched cards.

Use BAY STATE as <u>your</u> source of abrasive engineering service and products to get up-to-the-minute grinding performance. Call in your local Bay State Distributor, or write directly to Bay State Abrasive Products Co., Westboro, Massachusetts. Branch Offices are located in Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; with distributors in all principal cities.

In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE®
WHEELS of PROGRESS

Manufacturers of <u>all</u> types of Quality Abrasive Products

NEW!

WATERBURY FARREL SLOTTER

"Model 5"

DELIVERS UP TO 51,840 (BURR FREE) BLANKS PER HR....

SLOTS STANDARD & SPECIAL SCREW HEADS, FERROUS OR NON-FERROUS BLANKS #8 TO ¼" DIA., UP TO 2½" LONG, AT VARIABLE SPEEDS FROM 60 TO 864 PER MINUTE.

ONE "Model 5" Outproduces TWO Earlier Type Slotters

The speed and work range of this completely new Waterbury Farrel slotter make it more productive than a *pair* of earlier type slotters which used indexing dials and saw-into-work sequence.

The "Model 5" has long and short run versatility, too. Its simplicity and rapid set up make it economical for short runs while its high speed pays extra dividends on long runs.

Inexpensive Tooling

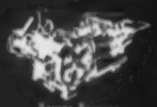
The only tooling required is a saw and burr-remover blades made inexpensively from spring steel. One dial, furnished as standard equipment feeds the above range of blank diameters. Special dials can be furnished for other blank diameters.

WATERBURY FARREL
Foundry and Machine Company
WATERBURY, CONN.

Branch Offices: Chicago • Cleveland • Millburn, N. J.

For further information, write for free bulletin or contact your nearest WF representative, today.

Bolt, Nut & Screw Machinery


Power Presses

Rolling Mill Machinery

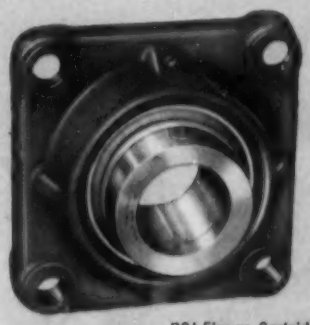
Wire Mill Equipment

Sendzimir Mills & Other Special Machinery

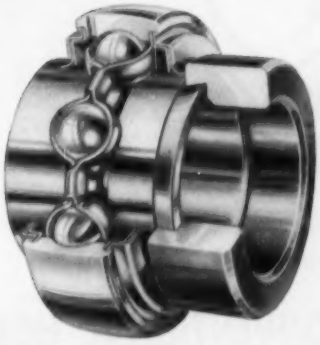
WATERBURY FOUNDED 1851 FARREL

NEW! Fafnir Wide Inner Ring Ball Bearings with PLYA-SEALS . . . *contact type*

A most important feature *. . . on slow-speed applications where service conditions are excessively dirty and moist*



RCJ Flange Cartridges
(Standard Series)



RAK, RAS Pillow Blocks
(Standard Series)

Plya-Seal Construction — for wide inner ring ball bearings. A synthetic rubber, contact-type seal located between two "dished" steel plates for extra rugged support.

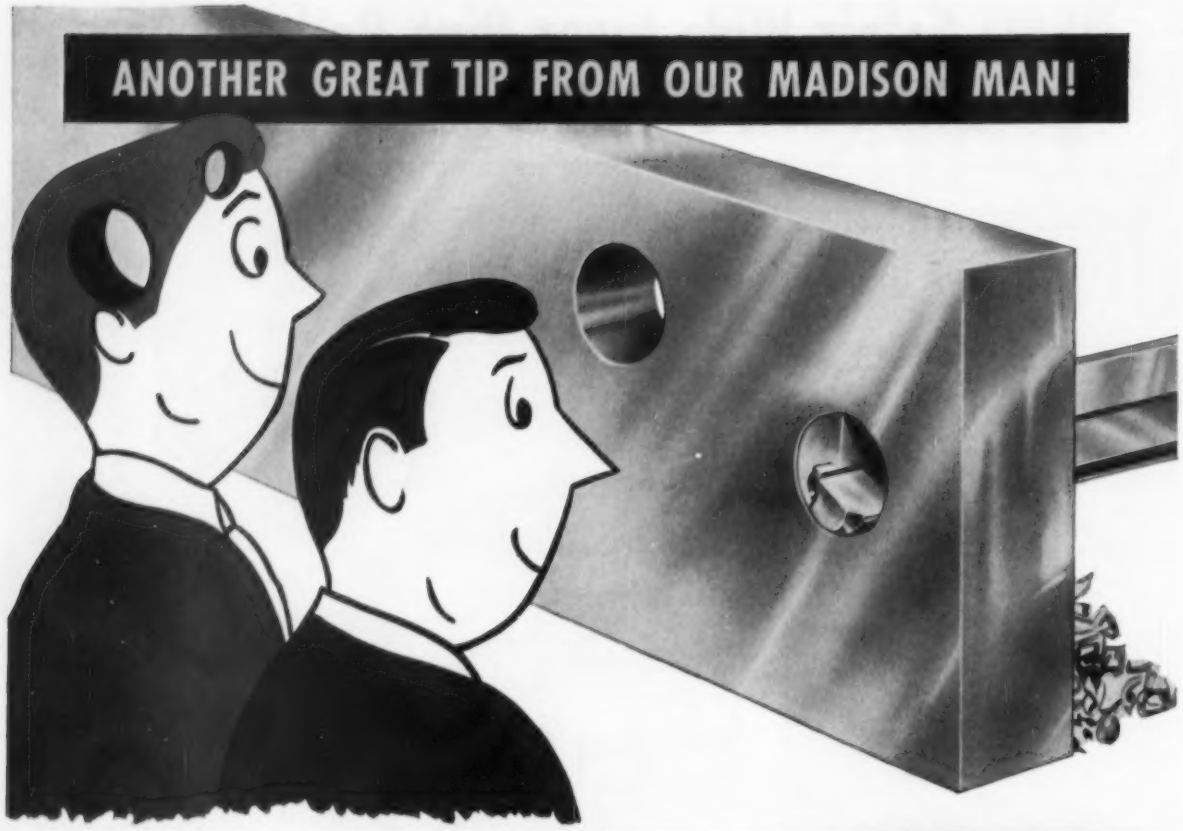
With the addition of this version of PLYA-SEALS to the Fafnir line of wide inner ring ball bearings, you can be more selective in the type of sealed bearing you specify and install. Where service at slow to moderate speeds demands most effective protection against contaminants, especially air-borne dust, dirt and grit, the Plya-Seal type offers the advantages of contact seals, tested and proven by years of service.

Plya-Seal Wide Inner Ring Bearings . . . are optional on the standard series Pillow Blocks and Flange Cartridges. They are dimensionally interchangeable with the Fafnir Mechani-Seal. Flared lip and clearance between inner supporting seal member and inner ring O.D. keeps seal from pushing in. Plya-Seals do not absorb contaminants, thus their surface won't glaze and lose its efficiency. *Fafnir Wide Inner Ring Bearings equipped with Plya-Seals are relubricatable!*

Here's an opportunity to improve operations, reduce servicing, eliminate loss of lubricant, provide the most effective protection from contaminants. For new Bulletin on Plya-Seal Wide Inner Ring Ball Bearings, ask your Authorized Fafnir Distributor or write The Fafnir Bearing Co., New Britain, Conn.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

ANOTHER GREAT TIP FROM OUR MADISON MAN!



GUN DRILLS FOR CONVENTIONAL HOLES!

"He told us they'd be **faster** and they are . . . We're doing the operation in less than half the time. He said we'd need **fewer passes**, and he's so right . . . we now get a **finished hole** with *one pass!* Our tolerances are closer and our surface finish better than ever before . . . in less time and at much lower cost."

If you are interested in cutting conventional drilling costs with Madison Gun Drills, write for our new literature that tells exactly how. And let your Madison man advise you on other hole problems, too. He'll advise the **right** tools for every job. He **knows** 'em all — because he **has** 'em all! *For further information write Dept. AM-56.*

Let the man with the holes in his head tell you how to cut costs in:

- ★ **Boring**
- ★ **Reaming**
- ★ **Deep Hole Drilling**
- ★ **Trepanning**
- ★ **Roller-Burnishing**
- ★ **Gaging**

MAIL COUPON TODAY

Dept. AM-56

☐ Please send me literature on Madison Gun Drills.

☐ Have representative call.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

Inner Diameters Are Our Business

MADISON

INDUSTRIES INC.

Muskegon, Michigan

ASSOCIATED WITH MADISON — FAESSLER TOOL CO.

THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

What Can Be Done About It?

There is no easy or quick way to overcome the shortage of scientists and engineers that has become a threat to our national security and economic progress. The solution can come only through diligent efforts extending over several years to bring the supply of technically trained people into balance with our needs. Meanwhile, the pressure of the shortage can be relieved if industry, government and education make better use of the limited number of scientists and engineers now available.

Earlier editorials in this series have discussed the dimensions of the shortage of technical manpower, its meaning for our national security and our economic well-being and the causes of the shortage. This final editorial will survey some of the measures that can be taken to overcome the shortage. Most of the proposals presented here have been suggested elsewhere. But in combination they appear to offer the best hope of an answer to this serious national problem.

Soviet Methods Not For U. S.

It is clear that no crash program, inspired by panic and designed indiscriminately to drive hordes of high school students into science and engineering, is suitable for the United States. Even if we adopted Soviet methods of channeling a large portion of our brightest young people into technical fields, it would be at least four years before results appeared in the volume of college graduates. And such an approach would do no credit to the American way of life.

Any crash program, whether it involved totalitarian methods or simply overselling the advantages of technical careers, would be objectionable for other reasons as well. It would jeopardize the quality of scientific and engineering training. It would put many young people in fields where they have little aptitude and deny them to other fields for which they are better equipped. And, if carried too far, it might even result in the overcrowding that was feared prematurely a few years ago.

The most important problems for the long run, as the preceding editorial in this series indicated, are in the area of education. Any real solution must reduce the loss of talented high school graduates who do not continue their education for financial reasons or because of lack of interest. Also, it must improve the quality of high school preparation in science and mathematics and, above all, relieve the critical shortage of teachers.

Basic Needs in Education

Substantial increases in salaries of teachers in most of the nation's school systems are essential if high school students are to receive adequate preparation for courses in science and engineering. Pay scales that have lagged behind rising living costs and salaries available in industry have placed great strain on even the most devoted teachers. There has been a sharp drop in the number of new graduates trained to teach science and mathematics, and of this smaller number many have decided not to follow careers in teaching.

Raising teachers' salaries to more realistic levels must be primarily the job of local school districts, aided by state governments. If, in face of rapid increases in school enrollments, local and state resources prove insufficient, then federal aid will have to be considered. Higher teachers' salaries, however financed, inevitably mean higher taxes. But without appreciable improvement soon, the quality of our entire educational system is in danger.

At the college level also, financial aid is needed to provide scholarships for promising students and to increase faculty salaries. (An earlier series of editorials dealt more fully with these problems, and business aid to higher educational institutions has been mounting at a gratifying rate.)

But not all the educational problems related to the shortage of scientists and engineers can be solved with money. Science and mathematics have steadily been de-emphasized as more youngsters have gone to high school for terminal education rather

How business is helping to relieve the shortage of technical manpower

Summary of a Survey by McGraw-Hill Correspondents

- Sponsoring summer study programs for high school teachers
- Arranging cooperative work-and-study programs for students
- Sponsoring college fellowships and scholarships in science and engineering
- Paying tuition of employees taking science and engineering courses
- Keeping college faculties abreast of new developments in industry
- Hiring high school science teachers for summer and part-time work
- Giving old, but usable, laboratory equipment to schools
- Cooperating in high school science exhibits
- Sponsoring regional science fairs
- Sending speakers and training aids to schools
- Opening plants for student tours
- Analyzing jobs to relieve engineers and scientists of routine work

The McGraw-Hill Department of Economics will be glad to hear of any other ways business is helping relieve the shortage.

than for college preparation. This de-emphasis must be reversed.

Techniques of instruction, furthermore, can stand improvement at all levels of education. Professor E. P. Northrup of the University of Chicago observes: "In the past fifty years . . . there has been a revolutionary change in the character of mathematics, yet not a trace of this change is to be found in the curricula of all but a handful of secondary schools throughout the country." Colleges and universities may have to examine old fetishes about light teaching loads and small classes in order to make more efficient use of their faculties.

What Industry Can Do

Industry has the immediate problem of better utilization of available technical manpower and the long-range responsibility of helping increase our resources of trained people. Frantic recruiting practices and reckless bidding up of starting salaries—financed largely by government money for defense orders — are not the answer. There is need for earnest consideration of incentives for experienced scientists and engineers, who too often must look to sales or executive positions for adequate financial recognition.

Industry in many instances could make more efficient use of engineers and scientists by shifting work to technicians, clerical personnel and even machines. One company found that 15% of the time of an engineering design group was spent on routine jobs and that this valuable time could be saved by adding a technician and a clerical worker to the group.

Other potential sources of technical manpower could be tapped more extensively to relieve the shortage. Very few women have entered what has been traditionally a man's world. Negroes are only slowly gaining educational and employment opportunities in technical fields. And many experienced older men can still give useful service.

A Good Beginning

Much is being accomplished already in efforts to attract more young people into scientific and engineering careers. A summary of some of the things business is doing is presented above. Other notable contributions are being made by such organizations as the professional engineering and scientific societies (especially through their manpower commissions), the National Science Foundation, the National Research Council, the National Education Association, the National Merit Scholarship Foundation and the Thomas Alva Edison Foundation.

Results are beginning to appear in rising enrollments in engineering schools and technical institutes. Between 1951 and last year, according to McGraw-Hill's annual survey of technical institutes, enrollments in these schools rose from 46,000 to a record 67,000. Engineering enrollments rose in the same period from 166,000 to 243,000. A rising tide of graduates is already being made available to American industry.

This is a good beginning. But only with wider appreciation of the serious implications of the shortage of scientists and engineers and intensified efforts on the part of business, government and education to relieve the shortage can we hope to overcome this threat to our national security and economic well-being.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

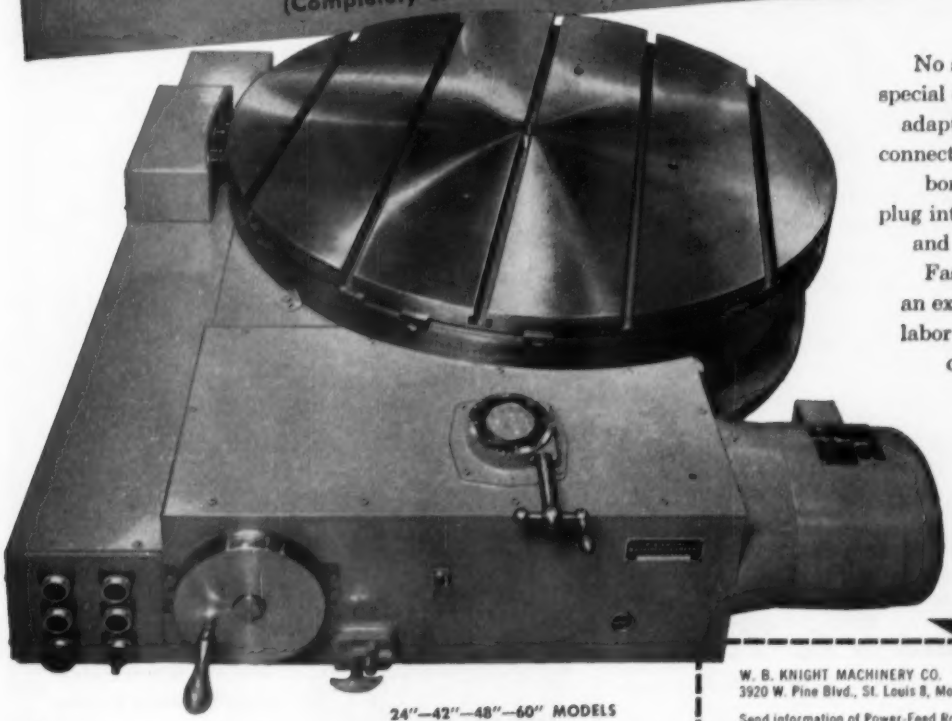
Do ALL These Jobs On ANY Milling Or Boring Machine:

- ✓ Rotary Milling and Indexing
- ✓ Automatic Cycle Milling
- ✓ Continuous Face Milling
- ✓ Cam Milling
- ✓ Automatic Positioning
- ✓ Revolving Fixture Operations

20" MODEL
18 feed changes—
1½" to 52" or 3" to 108"

with KNIGHT'S POWER FEED **Rotary Tables**

(Completely Self-Contained & Motor Driven)



24"—42"—48"—60" MODELS
Infinitely variable feed

No setup time—no special equipment or adaptors—no feed connection to milling or boring machine! Just plug into electric outlet and it's ready for work. Fast and accurate—an exceptional time and labor saver! Mail coupon for catalog.

KNIGHT VERSATILE ACCURATE RIGID

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE BLVD. • ST. LOUIS 8, MO.

ATTACH TO COMPANY LETTERHEAD

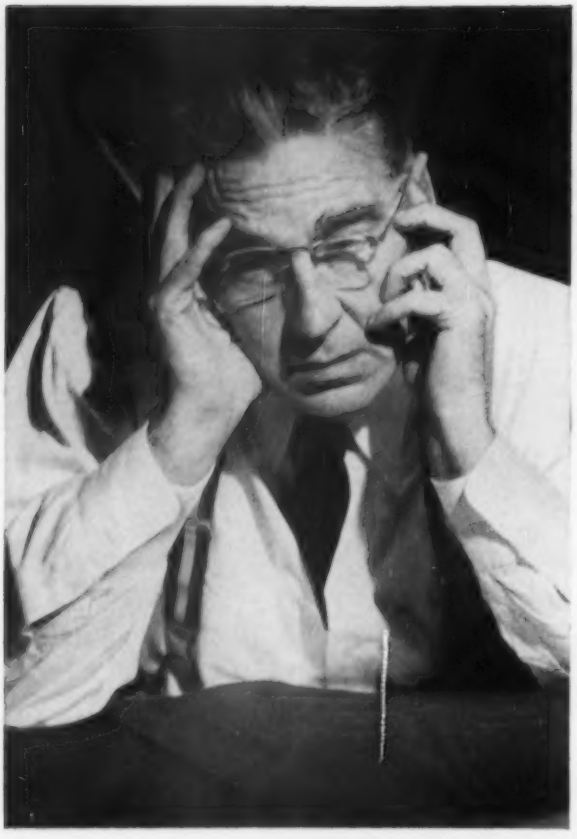
W. B. KNIGHT MACHINERY CO.
3920 W. Pine Blvd., St. Louis 8, Mo.

Send information of Power-Feed Rotary Tables.

NAME .....

TITLE .....

☐ Also send details on Knight Milling Machines



send it out to CDT

There is no faster, more reliable way to get help with difficult tooling problems than to send it to Columbus Die-Tool. Backed by 50 years of experience, CDT has three basic objectives when designing and building tools, jigs, fixtures or special machinery.

1. Increase Production
2. Improve Quality of Product
3. Lower Production Costs

These and other benefits are reasons why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool. Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

This underwater photo dramatically illustrates speedy dispersibility of new Dow Corning Antifoam B.

NEW Silicone Defoamer ANTIFOAM B

stops coolant foaming *fast*

fast acting
New Dow Corning ANTIFOAM B disperses immediately in aqueous solutions. No stirring or agitation required.

ready to use
Just add "as is." No delays for diluting or mixing. No need for extra containers.

lasts longer
Will not oil out, plate out, settle or precipitate in most applications. Ideal for continuous processing.

stable
Long storage life—stays uniform even if frozen or boiled. Retains effectiveness after sterilization.

test
ANTIFOAM B at no expense . . . Write, wire or phone today for a generous FREE SAMPLE and full particulars.

DOW CORNING SILICONES

ADDRESS DEPT. 0311

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
first in silicones

VERSATILITY AND PRECISION TEAMED FOR PROFIT...

COVEL No. 32
UNIVERSAL AND TOOL GRINDER

As a man responsible for the profitable operation of your department or plant, you recognize the value of a machine which teams versatility with precision—does several different jobs, and does them well. Such a machine is the Covel No. 32!

On your internal, external and circular form grinding—on your tool sharpening operations—No. 32 reduces costs, increases your profit margin.

For convincing facts on this new 12 x 30 universal and tool grinder, with infinitely variable table and headstock speed control, mail the handy coupon right now!

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN
Dept. AM-236

HYDRAULIC & HAND FEED
SURFACE GRINDERS • UNIVERSAL
CUTTER & TOOL GRINDERS • DRILL GRINDERS

☐ Send full details on the No. 32.
☐ Have your representative call.

Name _____ Title _____
Company _____
Street _____
City _____ State _____

Northfield KEYSEATER

Model K-6

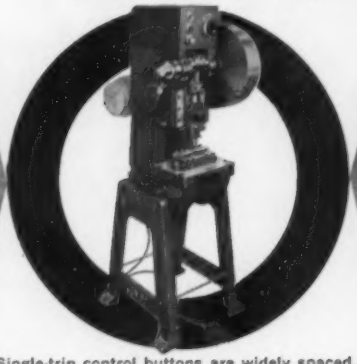
The New Northfield Model K-6 Keyseater is designed to cut straight or tapered keyways from ⅛" to 1" wide. Work of any shape and diameter can be clamped to the table and cut, grooved, or slotted.

Well engineered design features assure work of exceptional accuracy. Over 30 years of quality machine design and manufacture guarantee satisfaction.

Northfield FOUNDRY & MACHINE CO.

★ ★ ★ NORTHFIELD, MINNESOTA, U.S.A.

KENCO 15-ton ELECTRO-SAFE – the safest punch press you can buy!



Single-trip control buttons are widely spaced, to keep hands clear of the danger zone. Operator must push **both** buttons at once... hold them until stroke reaches bottom, then release both buttons to start new cycle. Fail-safe operation. Impossible to "fudge." Impossible for press to double trip.

VERSATILE CONTROLS—You can change from "single trip" to "continuous stroke," or "inching" by merely turning a dial. You can change timing in seconds. No flywheel... no clutching. Write for details.

KENCO MANUFACTURING CO.

Mfrs. of Precision Machinery and Accessories

5211 Telegraph Road, Los Angeles 22, California

For most economical threading on all Automatic Screw Machines, Chucking machines, Bolt threaders, Drill presses, etc.

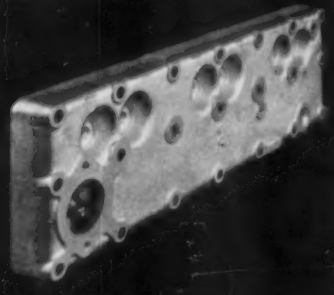
H & G insert chasers

CUT YOUR COSTS AND DOWN TIME

For less than $45 you get 12 sets of ⅝-16 (or any stockable size) Insert Chasers; each set ground ready for business. This dozen sets can thread hundreds of thousands of parts with no down time or sharpening time. Can be thrown away when dull or if you prefer, flash grind the dull sets and make an extra profit. Threads stand critical examination and conform to the close tolerances of Class 3 fits. Send for our digest of the Government publication, "UNIFIED AND AMERICAN SCREW THREADS".

THE EASTERN MACHINE SCREW CORPORATION 20-40 Barclay St., New Haven, Conn.

BORES MOTOR BLOCKS 22% FASTER— AND WITH 28% LESS TOOL WEAR



...thanks to

FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 14, Niagara Falls, N.Y. 56-54

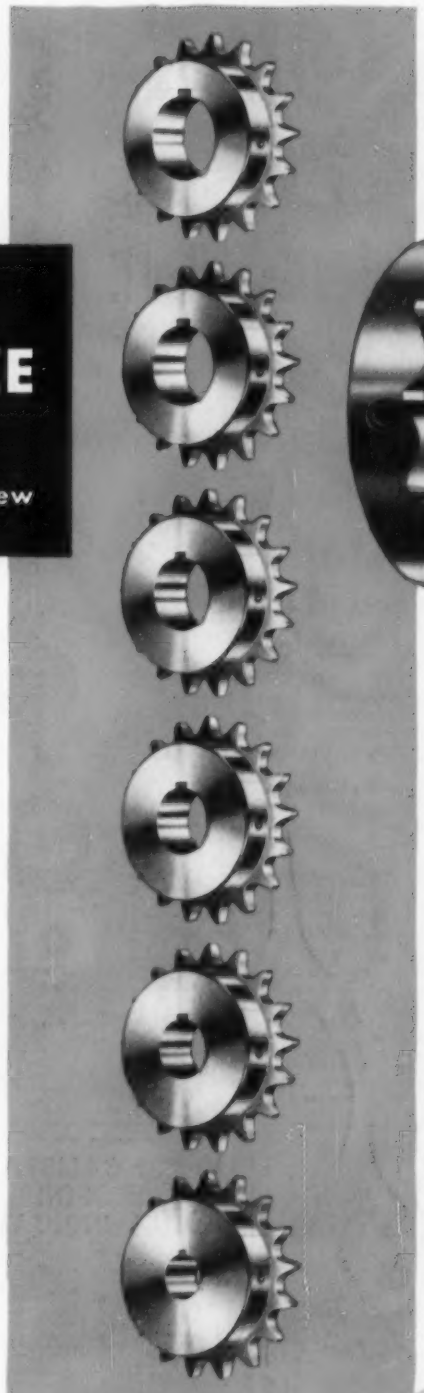
CARBORUNDUM®

NOW! – another cost-saving service from your nearby **BOSTON Gear DISTRIBUTOR**

STANDARD STOCK

BORED-TO-SIZE SPROCKETS

complete with Keyway and Setscrew



76 TOOTH SIZES
321 STOCK BORES

"OFF-THE-SHELF" — AT FACTORY PRICES

FINISH BORED – READY TO INSTALL Single width steel sprockets 3/8" Pitch through 1" Pitch — in 76 commonly used pinion sizes — with a full selection of finished bore diameters for each sprocket — complete with keyway and set screw.

ELIMINATE BORING EXPENSE You save expense of reboring, keyway cutting, drilling and tapping for setscrew—and avoid down-time in emergency replacements.

BOSTON GEAR QUALITY Sets the standard for precision and performance—assures longer service life for both sprockets and chain.

OFF-THE-SHELF DELIVERY More than 100 BOSTON Gear Distributors can supply BORED-TO-SIZE Sprockets from stock. Get complete information, on any question of sprocket selection or application, from factory-trained specialists . . . at the Distributor near you. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

The BOSTON Gear complete line provides any Sprockets you need including SHOLD-A-GRIP interchangeable tapered Sprockets and Bushings. For complete listings, see BOSTON Gear Catalog No. 56.

CALL YOUR **BOSTON Gear** DISTRIBUTOR

For nearest Distributor, look under "GEARS" in the Yellow Pages of your Telephone Book.

56BG-8-23

"More than
TWENTY MILLION HITS
since we changed to Lamina Guide Pins and Bushings!"

"Since changing to Lamina Guide Pins and Bronze-plated Bushings on our dies, they have run more than 20,000,000 hits . . . and they're still going! Formerly, the best we could get was 4,000,000 to 5,000,000 hits on any make." *This is a typical quotation from an actual user letter.*

Lamina bronze-plated wring-fit bushings are pre-finished on the I.D. Seated on a shoulder square with the die shoe surface and secured by special retainers, they assure distortion-free, full bearing surface that results in better die alignment, less maintenance and longer die life.

Lamina Guide Pins are special tool steel, heat treated, spray quenched, hardened, ground and burnished. The uniform, hard surface resists wear, while the tough core won't bend in installation or use. These dimensionally accurate pins do not "mushroom" or get out of round, and require no "running in."

There is a size and type Lamina Guide Pin and Bushing for every need. Our new catalog shows illustrations, applications, dimensions and prices of more than 800 items. Ask your die set supplier, or write us for your free copy now.

SHOULDER TYPE PIN. 1" to 6½" diameter. Straight and Removable types also available.

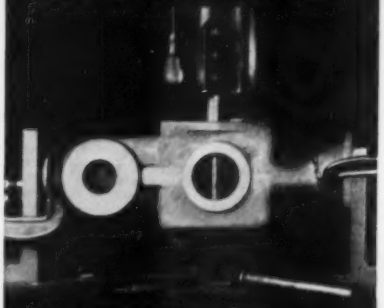
LONG SHOULDER Bronze Plated Bushing contains pin during entire stroke. ¼" to 3" I.D.

NUT TYPE Bronze Plated Bushing for wide range of requirements. 1" to 2" I.D.

SPECIAL PINS AND BRONZE-PLATED BUSHINGS for any application . . . tailored to your requirements. Send prints for prompt quotation.

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

33% DECREASE IN DIE WEAR ON THIS GRAY IRON FITTING



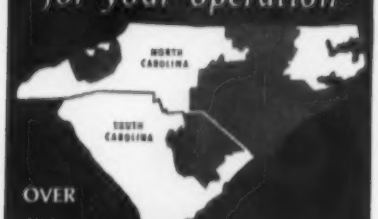
...thanks to
FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 15, Niagara Falls, N.Y. 84-56

CARBORUNDUM®

THE RIGHT LOCATION
for your operation

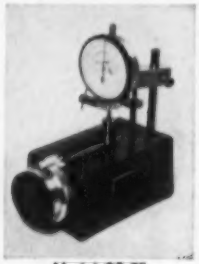


OVER
350
COMMUNITIES TO CHOOSE FROM

Address S. P. Vecker, Vice President Area Development Dept.

Carolina Power & Light Co.
RALEIGH · NORTH CAROLINA

CSI CALIBRATOR FOR DIAL INDICATORS



Model CS-75

THE DIAL INDICATOR CALIBRATOR is used to check and calibrate the accuracy of dial indicators and production checking of pieces having a number of different diameters. The range is 0 to ½" travel of CW or CCW indicators. Direct reading is to .000025". Standard unit set for AGD stem on indicators. (Pat. applied for).

Folders and Price upon request.

CUSTOM SCIENTIFIC INSTRUMENTS, INC.
541 Devon Street, Kearny, N. J.

GIVE YOUR DOCTOR A CHANCE

400,000 Americans, leading active lives today, are living proof of the fact that cancer can be cured if detected in time. Give your doctor a chance to give you this protection by having a physical checkup every year of your life. This should include a chest x-ray for men; for women, a pelvic examination. Make it a habit . . . for *life.*

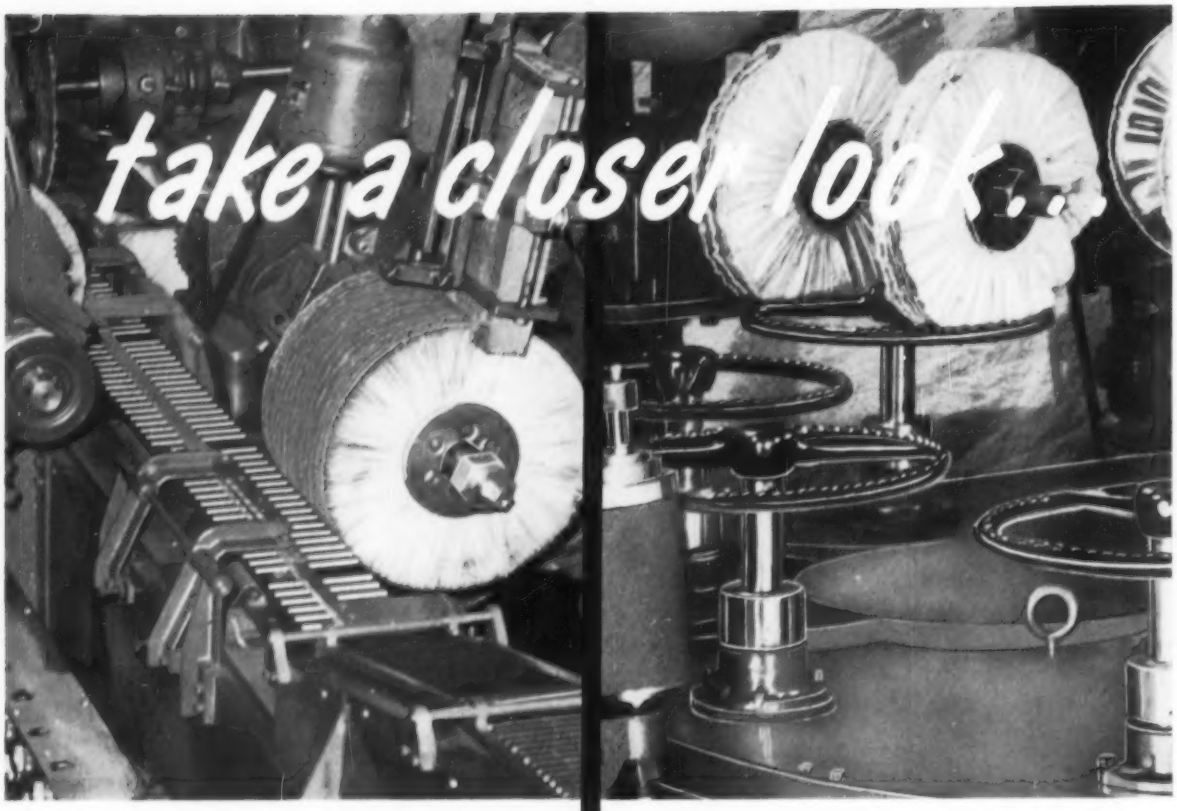
AMERICAN CANCER SOCIETY

"Yep, Biggest Stock in Town!"

That's what most GREENFIELD Distributors can boast when you ask about threading tools and gages. In fact, chances are that a GREENFIELD Distributor is *The Cutting Tool Center* in your trading area. His knowledge of local demand and of suppliers, his stocks on hand, his ability to give service, all are yours when you buy through a distributor.

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

Buy taps from DISTRIBUTORS • • • from GREENFIELD DISTRIBUTORS



. . . at automatic buffing and polishing with

PACKER-MATICS

Just two examples to illustrate how Packer-Matic high speed automatic polishing and buffing machines are constantly performing production miracles with semi-skilled operators. Investigate the profit possibilities of Packer-Matics—call or write today!

No. 14-8 ROTARY INDEXING

OUR ENGINEERING STAFF INVITES YOUR INQUIRY.

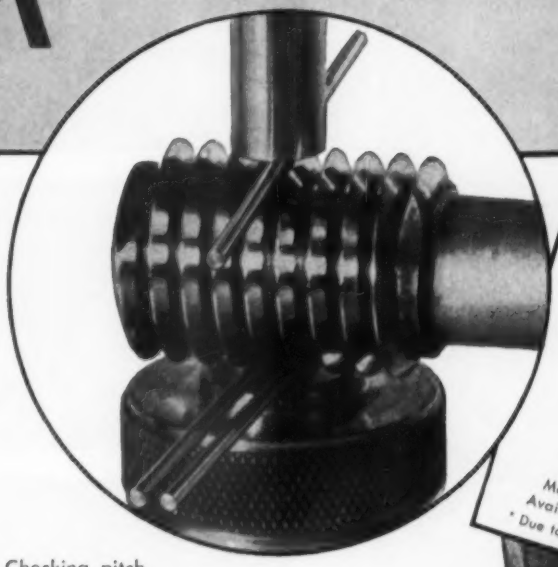
PACKER-MATIC

AUTOMATIC MACHINES FOR BUFFING • POLISHING • DEBURRING

THE PACKER MACHINE COMPANY • MERIDEN, CONNECTICUT

VK THREAD MEASURING WIRES

▼ *Standard equipment everywhere*



Checking pitch diameter of thread gage by three wire method on VK Light Wave Micrometer.

VK STANDARD THREAD WIRES
Now up to 75% INCREASED ACCURACY
IN YOUR P.D. MEASUREMENT
For all standard Unified and American Threads 2 to 80 P
When you order the NEW
VK CALIBRATED THREAD MEASURING WIRES WITH MATCHED CONSTANTS
Max. Theor. Meas. P.D. Error* = .000015"
Available from stock at no increase in price.
* Due to effect of wire diameter

Every set of VK Standard Thread Measuring Wires, in addition to being within .000020" of best size, is now calibrated and furnished with matching constant. In many cases this will result in considerably more accurate pitch diameter measurements. These wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 H.S. pictured at the right will fill your needs. Similar sets to ± .000020" accuracy are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used.

Set No. 20 H.S. Thread Measuring Wires

Set No. 20 H.S. Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires....$135.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

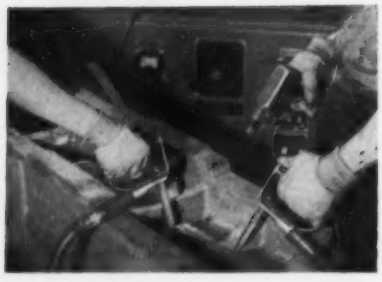
VK

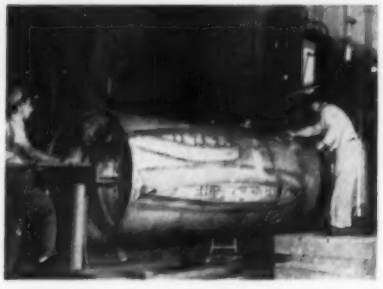
37th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.





Want up-to-date production ideas

on INSPECTION · TESTING · QUALITY CONTROL

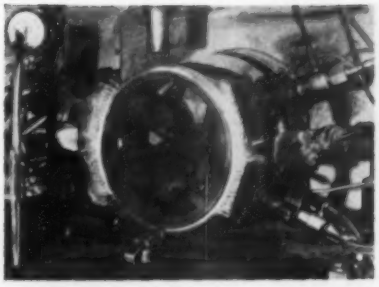
...look in Sections E and F—AM's 1957 Production Planbook and

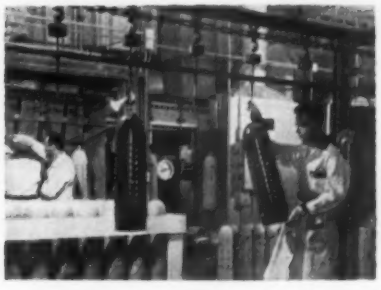
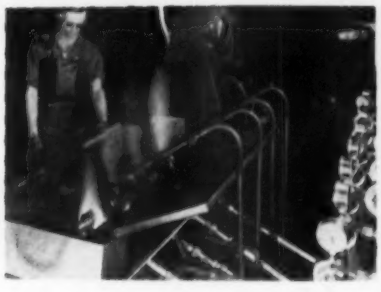
New York—A treasure of production "Nuggets"—solid, useable ideas from previously published articles in AM—covering inspection, testing, quality control, assembly, heat-treat, and finishing practices and equipment will be found in Sections E and F of AM's 1957 Production Planbook and Buyer's Guide Issue. Section F will also cover latest developments in welding and portable tools.

New inspection techniques and devices; testing ideas and policies; steps to be taken to control quality before, during and after production and assembly; assembly developments including welding, brazing and joining practices—and such automated assembly ideas that do not appear elsewhere; latest heat-treat ideas and equipment; and product finishing techniques and apparatus, all condensed into single quickly digested ideas will compose the two sections. AM page numbers and issue dates in which the full article appeared will be supplied for easy reference by subscribers wanting more detailed information, diagrams, drawings or illustrations.

11 Fact-packed Sections

Outlined above are only two of 11 sections making the American Machinist 1957 Production Planbook and Buyer's Guide Issue Metalworking production's first "packaged planning" reference volume. Titles of the other sections are shown at right. With this essential working tool, exclusive to *American Machinist*, readers may plan 1957 production, adopt latest Metalworking techniques and locate sources of supply for all the production equipment, materials of manufacture, parts and supplies they require.



· ASSEMBLY · HEAT-TREAT · FINISHING?

Buyer's Guide Issue, due Mid-November, 1956

Sections, as in the past, will be thumb-indexed for easy reference, and the issue will open flat for complete visibility and convenient use. A special mailing carton is provided.

New Buyer's Guide

Major new feature of the 1957 Planbook will be a Buyer's Guide section listing nearly 7000 sources of supply under almost 1500 headings, cross referenced for rapid, easy use. Headings for everything used by Metalworking production—from basic materials to electric motors, from production equipment to bearings and gears—will be developed, with suppliers' names and addresses listed under them.

Shop-Oriented Reference Issue

Production "Nuggets"; Developments to Watch in '57—vital planning checklists; Manufacturers' Free Literature lists; and the new Buyer's Guide feature form a single-issue reference volume usable indefinitely to stimulate "How-to-do-it", "What-to-do-it-with" and "Where-to-buy-it" ideas for greater production at less cost, better quality control, and more profitable operations.

1957 OUTLOOK

MANAGEMENT, PERSONNEL A

MACHINING B

TOOLING C

PRESSWORKING, MOLDING, CASTING D

INSPECTION, TESTING, QUALITY CONTROL E

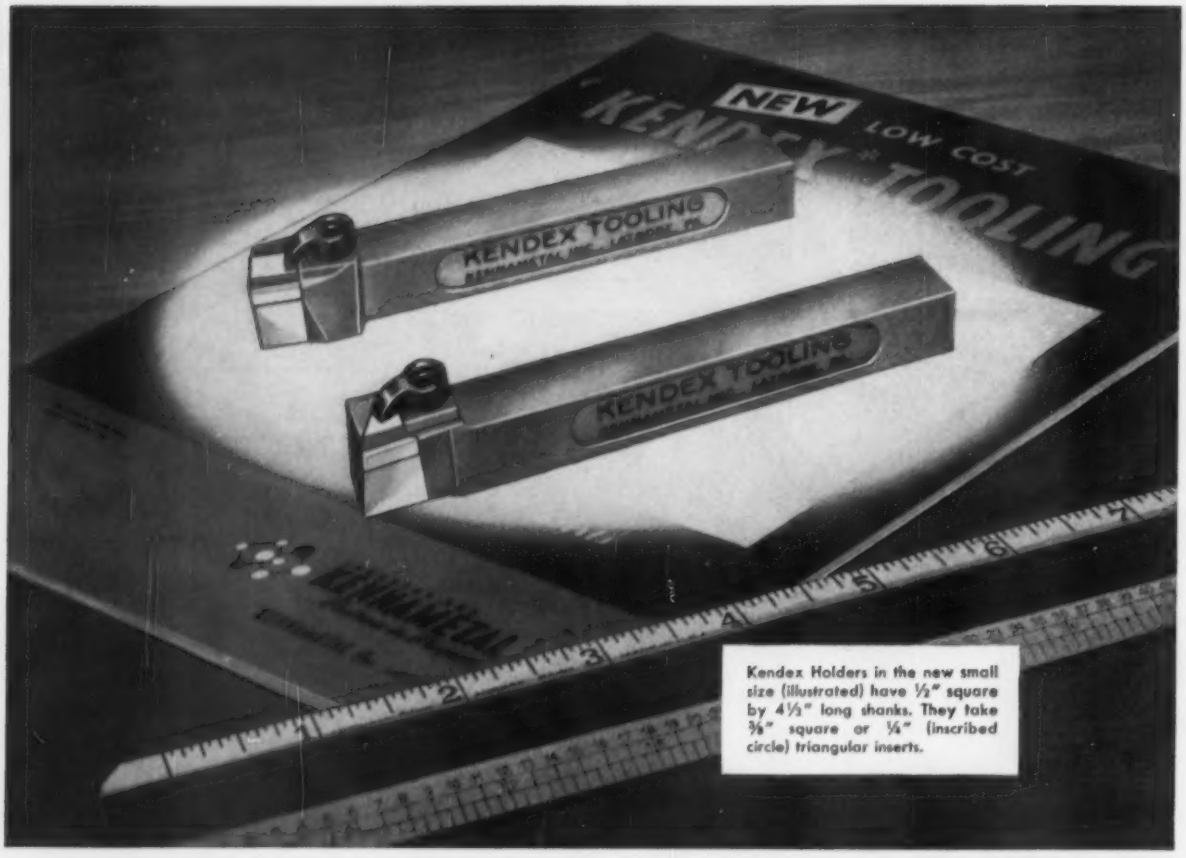
ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS) F

MATERIALS, COMPONENTS G

MATERIALS HANDLING, SERVICES H

PRIZE IDEAS, REBUILT EQUIPMENT I

BUYER'S GUIDE J



Kendex Holders in the new small size (illustrated) have ½" square by 4½" long shanks. They take ⅜" square or ¼" (inscribed circle) triangular inserts.

NOW, small Kendex* Button Tools with turnover "throw-away" inserts

...for light machining on high production operations
...especially useful for boring operations

Another variation of the popular Kendex Tooling is now available. This is the new ½" Kendex Holder, available in four styles, for use with triangular or square Kennametal* "turn-over" button inserts . . . making available small tools with the many advantages and economies of the Kendex principle:

- grinding is eliminated
- inserts are indexed quickly to each new cutting edge
- machine downtime is reduced to a minimum
- production is increased

If you are interested in small-sized, rugged, dependable clamped-type tooling, ask your Kennametal tool engineer to show you how these small Kendex holders can be used to advantage on your operations. Or write for Booklet 301. KENNAMETAL INC., Latrobe, Pennsylvania.

*Registered Trademark

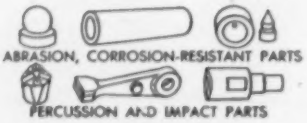
B-5975

Small-sized Kendex Tools are equipped with Kennametal chip breakers and solid Kennametal seats to back up inserts.

Kennametal inserts for small Kendex holders are stocked in a number of grades including the new K7H grade for high velocity operations and for machining heat-treated or high tensile steels.

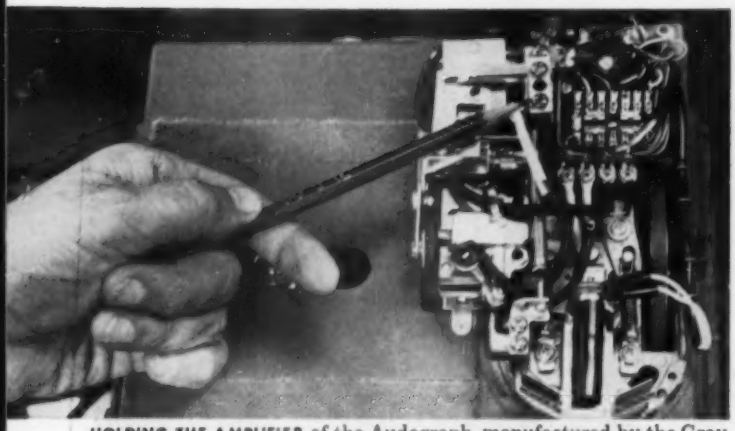
Tell us your small-tool problem and our tool engineers will help you select the right tool and grade of cutting edge.

INDUSTRY AND
KENNAMETAL
...Partners in Progress



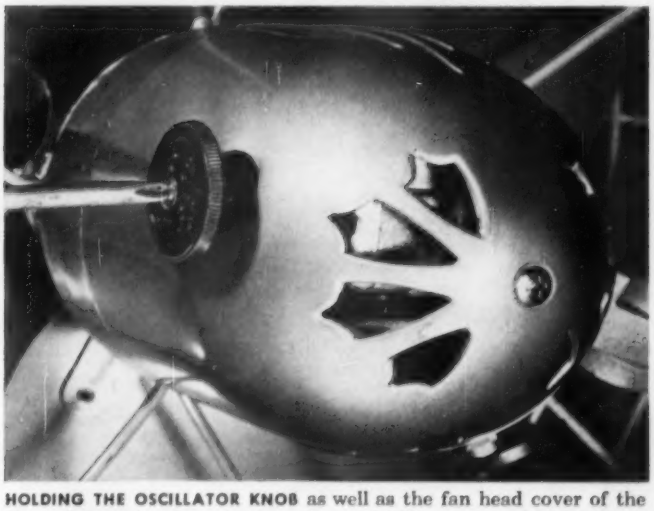
PHILLIPS CROSS RECESSED HEAD SCREWS

are holding down many important jobs



HOLDING THE AMPLIFIER of the Audograph, manufactured by the Gray Manufacturing Company, there are Phillips screws. Mr. William Sherman, Director of Sales, says, "Phillips screws enable us to meet the rugged performance standards required of the Audograph machine and to meet our competition in the dictation field."

HOLDING THE pre-SURE-tool of the Buchanan Electrical Products Corporation, are four Phillips screws. "By switching to Phillips screws we accelerated production, prevented driver slippage, increased the torque applied to each screw and eliminated the unattractive 'chewed up' screw head," says Mr. Mittleman, Plant Superintendent and Production Manager.



HOLDING THE OSCILLATOR KNOB as well as the fan head cover of the Fasco Industries, Inc., fans, you'll find Phillips screws. Mr. Weiland, Assistant Purchasing Agent of the company says, "When we introduced Phillips screws, we immediately improved assembly. They also eliminated burring and improved the appearance of Fasco fans."

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

THE FASTENERS OF TODAY...
AND OF THE FUTURE
X *marks the spot*
the mark of extra quality

Pledged to highest standards...

The Phillips Screw manufacturers listed here cooperate to turn out a uniformly high standard of quality. As sponsors of the Phillips Cross-Recessed-Head Standards Committee they adhere to the established dimensional standards, gauges, and gauging methods which will best serve industry.

Members of Screw Research Association

American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Co. Elco Tool and Screw Corporation • Great Lakes Screw Corp. • The H. M. Harper Company • The Lamson & Sessions Company • National Lock Company • The National Screw & Manufacturing Company • Parker-Kalon Division, General American Transportation Corporation Pheoll Manufacturing Co. • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hdwe. Mfg. Company • Sterling Bolt Company • Universal Screw Company • Wales-Beech Corporation

New P&H Constant Voltage Welders Offer

BIG SAVINGS

... save hundreds of dollars in installation and wiring costs... reduce power consumption

P&H Constant Voltage Welders are easier to operate and give you better welds. You get instant starting and recovery even on tack welds, or areas of poor fit-up. They let you select the arc voltage you desire. Voltage remains constant during the entire welding cycle to give you a uniform rate of deposit.

Job-proved on all automatic-welding processes, P&H Constant Voltage Welders are used for submerged arc, inert gas, semi-automatic hard surfacing, automatic stud or low current density welding.

Enjoy high efficiency (85% or better) with P&H Constant Voltage Welders. 500, 750 and 1200-amp capacities. Send in the coupon for more information.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

I'M SMOOTH-ARC SCOTTY... with some important facts on P&H Constant Voltage Welders that will save you money. Just drop me a line.

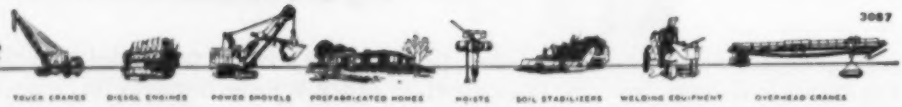
P&H Constant Voltage Welders give you more efficiency plus big dollar savings in all automatic-welding processes.

P&H HARNISCHFEGER CORPORATION
Welding Division
4514 West National Avenue, Milwaukee 46, Wisconsin
Attention: Mr. W. R. Stephens, Sales Manager
I'd like more information on P&H Constant Voltage Welders.

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....

SEND FOR FREE INFORMATION TODAY!

the P&H Line



3087

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

MAGNESIUM for low cost tooling

DOW

MAGNESIUM *machinability beats tight schedules*

Machinability and handling ease are two reasons Carr Lane moves jobs faster, at lower cost, with magnesium tooling plate

When a job has to be completed in a hurry, which is often the case at Carr Lane Manufacturing Company, St. Louis, there are big advantages in using magnesium tooling plate.

FASTER MACHINING. Production operations go faster because magnesium jigs and fixtures are easy to machine, easy to weld. Excellent dimensional stability and precision flatness help to hold the closest tolerances. These properties also help to save many hours in the process. On the fixture illustrated, it would take twice as long to do the job in aluminum—and ten times as long in steel.

FASTER HANDLING. The light weight of magnesium, two-thirds that of aluminum, permits pieces to be handled and moved from one operation to another with a minimum of time, effort and equipment. This is particularly important with large jigs and fixtures which couldn't be handled manually if they were made of steel.

FASTER AVAILABILITY. You can get magnesium tooling plate when you want it and how you want it. Whether production deadlines are tight or not, it's always readily obtainable in any standard size and gauge from stock. Contact your nearest supplier of Dow Magnesium or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 372BB.

Available from stock at . . .

Copper and Brass Sales, Inc., Detroit, Mich. • Fullerton Steel and Wire Co., Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Co., Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

you can depend on DOW MAGNESIUM DOW

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

*A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

Model "D"

WRITE for COMPLETE DETAILS

CHANDLER TOOL CO
Muncie Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

SIGOURNEY
M-100
the PRECISION BENCH DRILLING MACHINE

No ordinary bench drilling machine, but an extremely accurate, high speed, sensitive machine for precision drilling. Drills from ¼" down to extremely small sizes. Successfully used down as far as .008".

Table and column exactly squared, one to the other, and built with strength and rigidity for maintained accuracy. Hardened and ground spindles insure long life. Sealed ball bearings throughout for smooth operation from 4,000 r.p.m. to 10,000 r.p.m. Motor, driving belt, and spindles entirely enclosed for safety. Available with 1, 2, 3 and 4 spindles.

SEND FOR ILLUSTRATED BULLETIN

SIGOURNEY TOOL COMPANY
(Division of The Smyth Mfg. Co.)
HARTFORD 6, CONNECTICUT

Sole Sales Agent
PRATT & WHITNEY COMPANY
INCORPORATED
West Hartford 1, Connecticut

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

ELIMINATE a Complete Operation!

BURR-BIT
DE-BURRS TAPPED HOLE WHILE TAPPING

• FAST
• EASY
• PRECISE

• SAVES TIME
• SAVES LABOR
• SAVES MONEY

By merely slipping a BURR-BIT on your tap in a matter of seconds, a complete secondary operation is eliminated. Designed to fit all makes of taps.

• ELIMINATE A SPINDLE

• GET A PERFECTLY CLEAN HOLE

• DE-BURR THIN MATERIAL

CAN BE EFFICIENTLY USED ON PRACTICALLY ALL MATERIALS—STEEL, ALUMINUM, PLASTICS, ETC.

Write for full details—Dept. AM-11

MADE TO FIT ALL TWO FLUTED TAPS FROM #2 TO 3/8ths IN ALL PITCHES. AVAILABLE FOR THREE FLUTED TAPS ON SPECIAL ORDER.

BLADES MADE EXTRA LONG TO ENABLE RESHARPENING MANY TIMES.

THE SENSATIONAL BURR-BIT IS A HIGHLY PRECISE PRODUCT MADE OF THE FINEST QUALITY HIGH SPEED STEEL, INDIVIDUALLY INSPECTED.

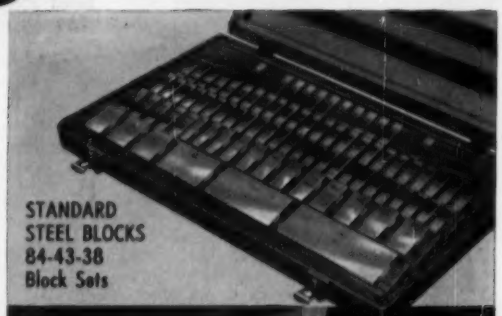
Dealers Inquiries Invited!

VERNON DEVICES, INC.
481 East 3rd Street,
Mt. Vernon, N. Y.

Webber Gage Blocks

Insure the Accuracy Essential To Mass Precision Production

Making Webber Gage Blocks is a science—a combination of human skill and the world's finest mechanical and laboratory equipment, both highly specialized. Only with such a combination can gage blocks be made to meet the high standards which Webber steadfastly maintains. Webber can fill your every gage block need, with the most complete line of gage blocks and related accessories.

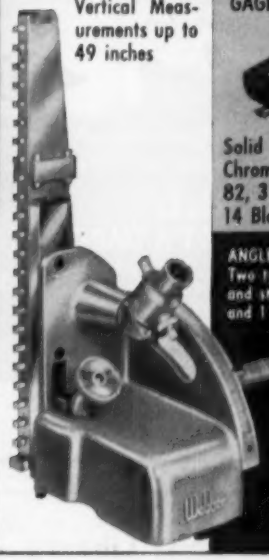


STANDARD STEEL BLOCKS
84-43-38 Block Sets

"THIN BLOCK" Gage Set
30 Blocks

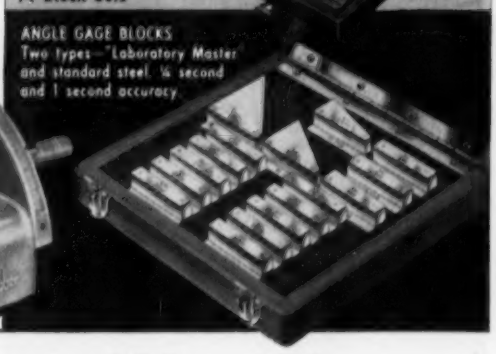
"LABORATORY MASTER"
Accuracy ± .000001"
Chrome Carbide
—82 Blocks

THE NEW WEBBER OPTICAL HEIGHT GAGE
Micro Accurate Vertical Measurements up to 49 inches



"CROBLOX" GAGE SETS
Solid Chrome Carbide
82, 33, 36 and 14 Block Sets

HEAVY DUTY GAGE SET
84 Blocks



ANGLE GAGE BLOCKS
Two types—"Laboratory Master" and standard steel. ¼ second and 1 second accuracy.

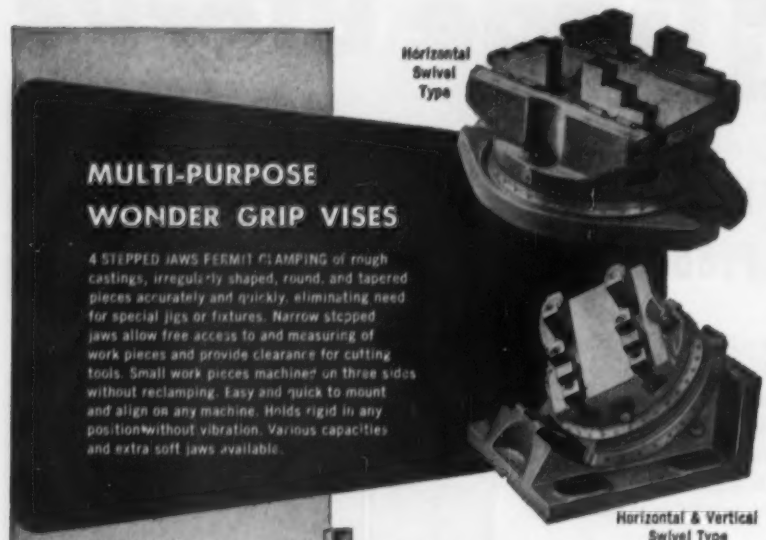
WEBBER ACCESSORIES—permit using gage blocks directly as snap or ring gages, scribers, and with a base block, as a height gage.

WEBBER TEMP-CHECK
Essential wherever accurate control of temperatures is a must. Measures liquids, gases or solids. 4 Models.

Webber GAGE COMPANY

12901 Triskett Rd. · Cleveland 11, Ohio

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS



MULTI-PURPOSE WONDER GRIP VISES

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Easy and quick to mount and align on any machine. Holds rigid in any position without vibration. Various capacities and extra soft jaws available.

TAPPING ATTACHMENTS

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout by long established reputable West German factory.

DISTRIBUTOR INQUIRIES INVITED

Also United States Distributors of European Machine Tools

Tested for Performance to High Amer. Standards
Immediate Delivery from N.Y. Stock

MADE IN GERMANY

Low Competitive Prices

- Quick Change Chucks and Collets
- Wille-Grip Keyless Drill Chucks
- Milling Machine Arbors, Adapters, Arbor Spacers and Bearings
- Lathe Mandrels

MBI

Our Headquarters in New York City

Write for complete details and prices to Dept. 20

M.B.I. EXPORT & IMPORT LTD.

A Division of Machinery Builders Inc.

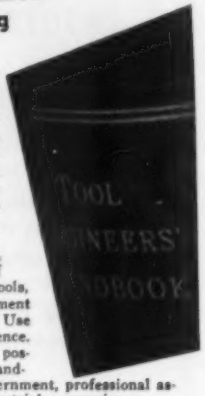
475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing and building machinery"

CABLE ADDRESS: Machbuild New York

Phone. MOtt Haven 5-0900

An outstanding reference on PLANNING, CONTROL DESIGN, TOOLING and OPERATIONS in the mechanical manufacturing industries



THIS handbook brings you the most modern, authoritative data on the design, fabrication, maintenance and economical use of tools and machinery used in industry. It covers product design and cost estimating, the economical selection of machines, processes, and tools, the analysis and improvement of setups and operations. Use it with complete confidence. Data are based wherever possible and practicable, on standards established by the government, professional associations and leading industrial companies.

TOOL ENGINEERS' HANDBOOK

American Society of Tool Engineers

Frank W. Wilson, Editor-in-Chief

Written by 144 authorities in the field, this massive reference, consisting of 115 big sections covering tool engineering from A to Z, has been checked and double checked from cover to cover to insure accuracy. Here are the complete, authoritative answers to your problems, brought to you in compact, easy-to-find form.

More than 2000 pages! Over 1500 illustrations! Hundreds of tables, charts, keyed diagrams, symbols, definitions, equations, etc.

A small selection of highlights selected at random to illustrate the scope of this Handbook:

- Describes types of machines, cutting tools, tool holders, fixtures and operations in precision production boring.
- Includes all new techniques and processes of recognized acceptance including Powder Metallurgy, Investment Casting, Plastic Joining of Materials, etc.
- Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting tool materials and cutting practices.
- Treats, process-wise, such topics as Plaster Mold Casting, Superfinishing, Rotary Swaging, Sheet and strip cold roll forming, Die Hobbing, etc.
- Covers every phase of metal cutting and machinability.
- Discusses welding, gluing and mechanical joining of materials.

SEE THIS BOOK 10 DAYS FREE

McGRAW-HILL BOOK CO.
330 W. 42nd St., N.Y.C. 36, N.Y.

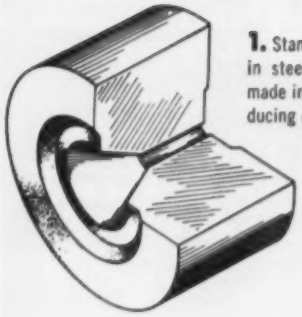
Send me the A. S. T. E.'s TOOL ENGINEERS' HANDBOOK for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents delivery, and $5.00 monthly until $15.00 is paid. Otherwise I will return the book postpaid. (We pay for delivery if you remit first payment with this coupon; same return privilege.)

(Print)
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position .....
This offer applies to U.S. only. FA-11-5-56

From the *American Machinist* Library of *Tips for Top Shop Men*

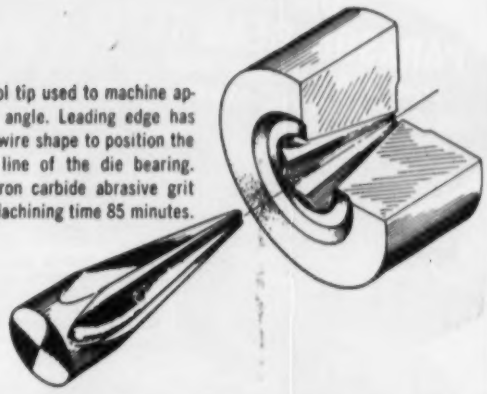
BE MAN enough to stand up and fight for what you say and believe—or don't say it. If you're afraid of the boss, making remarks behind his back won't give you confidence.

R.I.G. Case History No. 23

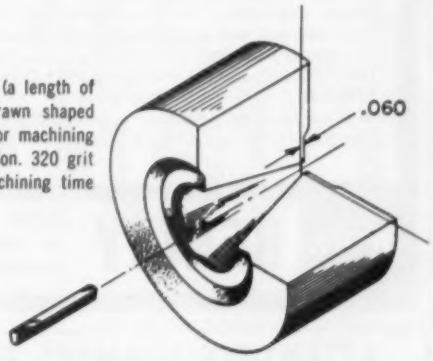


1. Standard rough-cored carbide nib in steel casing as supplied. To be made into a wire drawing die for producing ess shaped trolley cable wire.

2. Tool tip used to machine approach angle. Leading edge has an ess wire shape to position the center line of the die bearing. 320 boron carbide abrasive grit used. Machining time 85 minutes.



3. Tool tip (a length of previously drawn shaped wire) used for machining bearing section. 320 grit abrasive. Machining time 5 minutes.

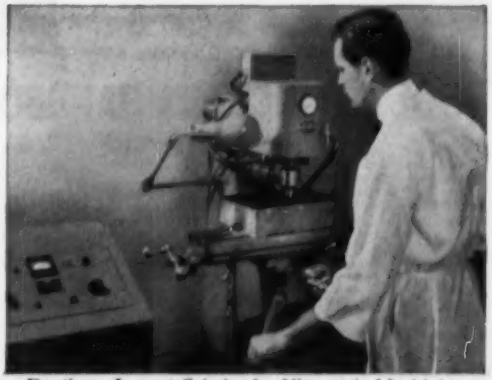


4. Completed die. Mat finish produced requires only 25 minutes to obtain mirror polish. Tolerance ±.0003" Made by conventional methods cost—up to $300. Produced on Raytheon Impact Grinder —$60 (including tools).

RAYTHEON IMPACT GRINDER CUTS COST $240 PER DIE PAYS FOR ITSELF IN TEN MONTHS

You can reduce your costs of machining hardened steel, titanium carbide, tungsten carbide and many other hard or brittle materials with the Raytheon Impact Grinder. Ultrasonic power is used for slicing, drilling, engraving, trepanning, shaping and lapping. Intricate shapes can be produced readily and high precision is possible since the work is not heated or stressed. The Impact Grinder machines to ±0.0002" with finishes to 8 microinches. It may be operated by semi-skilled personnel.

If you have a problem in machining hard or brittle materials, write Dept. 6120 and our Application Engineering Service will be happy to assist you. For new catalog, please request bulletin No. 2-332, Dept. 6120.



Raytheon Impact Grinder for Ultrasonic Machining

*Name of user on request.

RAYTHEON MANUFACTURING COMPANY

Equipment Marketing Department, Waltham 54, Mass.

RAYTHEON *Excellence in Electronics*

A3009

UNIVERSAL
PARKSON GEAR TESTER
FOR SPUR - WORM AND HELICAL & BEVEL GEARS

ABOVE PHOTO SHOWS SET-UP FOR WORM GEARS TO CHECK CENTER DISTANCE, CONTACT OF TEETH, RUNOUT, ETC.

CYLINDRICAL BUSHING

Scale and Vernier, Ease of adjustment, Convenient Features to hold Worm and Shaft on V-Blocks or Bushing.

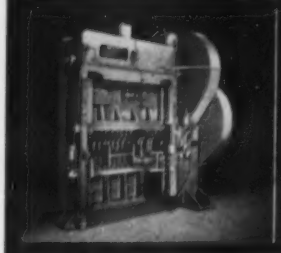
BETWEEN CENTERS

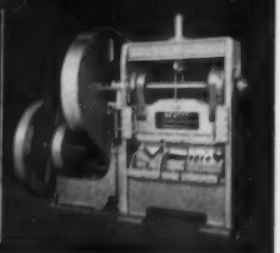
PARKSONS ARE MADE IN SIZES
9" - 15" - 24/30" — PLAIN AND UNIVERSAL
ASK FOR DESCRIPTIVE ILLUSTRATED BULLETIN

GEO. SCHERR CO., INC.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-AM LAFAYETTE ST. • NEW YORK 12, N.Y.

space problems?
better check . . .

BEATTY
METAL WORKING EQUIPMENT





GUILLOTINE BEAM PUNCH (left) — Punches flanges and webs of beams. Requires less floor space, lower first cost and extreme rigidity for longer tool life. Full capacity loading and punching across face of ram. 150, 200 and 350 ton models. **GUILLOTINE BAR SHEAR** (right) — For production or "short order" shearing of rounds, squares, angles and bars, without changing tools. Cap. 43 to 300 ton.

Write: BEATTY MACHINE & MFG. CO.
948 150th STREET,
HAMMOND, INDIANA

ALL INFORMATION, METHODS, AND IDEAS NEEDED TO PRODUCE *BETTER TOOLS AND DIES*

Practical Data on Popular Analyses of Tool Steels, their Selection, Heat Treatment, and Use

in the Revised, Enlarged EIGHTEENTH PRINTING of this

TOOL and DIE STEEL HANDBOOK

By Palmer and Luerssen

Here's the BOOK OF ANSWERS for every man responsible for tools and dies. Shows you how to increase your company's production from present equipment—how to reduce toolmaking trial and error, conserve tool steel, avoid die troubles, simplify heat treatment. Gives complete working information on everything from selection of the right steel to heat treating methods and equipment, hardness and toughness testing, latest data on high speed and hot work steels. 564 pages, 355 charts, photos, diagrams give you facts on: how design affects heat treatment, hardenability tests, time required to heat different tools to required hardening and drawing temperatures, furnace atmospheres, quenching, tempering, trouble-shooting.

INCLUDES 69-PAGE ALPHABETICAL SELECTOR SHOWING WHICH STEEL TO USE FOR ALMOST EVERY TOOL AND DIE. Use this book to train new men and upgrade skilled men.

OVER 111,000 COPIES IN USE! CLIP AND MAIL NOW

THE CARPENTER STEEL CO. • READING, PA. • DEPT. I

Please send me, postpaid, your revised "Tool Steel Simplified". I enclose $2.00 ($2.50 outside U.S.A.) in full payment of the book.

NAME _____ TITLE _____

FIRM NAME _____

MAILING ADDRESS _____

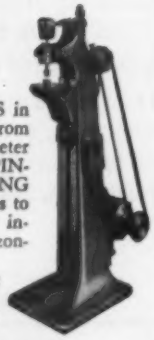
CITY _____ STATE _____
(Please print)

ATTENTION REAMERS BUYERS
70 YEARS CHOICE OF TOOL EXPERTS

REAMERS, MILLING CUTTERS, END MILLS, SPECIALS
ALVORD-POLK TOOL CO. Millersburg, Pa.

TANNEWITZ
VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.
The TANNEWITZ WORKS Grand Rapids, Michigan

GRANT



RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

CP Air Hoist...

handles loads with "Kid Gloves"

The Chicago Pneumatic Air Hoist's powerful variable speed rotary vane motor can be accelerated from a snail's pace to full speed . . . raises loads rapidly, sets them down gently. The Air Hoist is ideal for accurately spotting loads into position. Its fingertip pendant throttle places lifting and lowering controls in one hand . . . leaves other hand free for guiding the load along a tramrail and then lowering it into position.

The air motor has no switches to maintain . . . can't overheat, spark or shock. And it has an automatic, self-locking worm gear brake . . . there are no brake bands to wear out or adjust. The CP Air Hoist is portable . . . weighs only 57 pounds. Available in 300, 500, 700 and 1000 pound capacities.

Chicago Pneumatic

Chicago Pneumatic Tool Co., Dept. H-5
8 East 44th Street, New York 17, N. Y.

☐ Please send me FREE Air Hoist literature.
☐ Have salesman call.
No obligation of course!

Name_____
Company_____
Address_____
City_____ Zone____ State_____

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

External Grinder with two internal Spindles which are interchangeable with External Spindle on machine.

for Precision Grinding— *External Internal Surface!*

These versatile Grinders can be mounted on lathes, planers, boring mills, milling machines and other machine tools for a large variety of grinding operations which crop up in every shop.

Rigid construction throughout with large precision type bearings insure accuracy for production and tool room work. Constant speed motors provide the uniform wheel speed so vital for best grinding results.

Dovetail slide on spindles facilitates changing from one spindle to another with perfect alignment.

Large flat pad with several bolt slots adapts the Grinder to the regular tool holding fixture of the machine on which it is to be mounted.

Large selection of Internal Spindles available for various lengths and diameters.

Made in sizes from ¼ HP to 10 HP capacity

Other "HISEY" Products: Bench and Pedestal Grinders and Buffers; Snagging Grinders; Wet Tool Grinders; Disc Grinders; Drill Grinders and Dust Collectors.

ASK FOR CATALOG 72 XG

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO

From the *American Machinist* Library of *Tips for Top Shop Men*

TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

Understanding ALLOY STEELS

By removing the cloak of mysterious, highly technical terminology, this *American Machinist* Special Report clarifies the differences in commonly used alloy steels.

Alloy steel is just plain carbon steel to which one or more other elements are added to change some property or properties of the base material. These elements may affect the mechanical, magnetic, or chemical properties of the steel. This report discusses the relationship of alloy steel to plain carbon steel, and describes the alloy properties in terms of the standard classification.

This is one of a new series of *American Machinist* reports written to simplify metallurgy for the non-metallurgist. Earlier reports in the series discussed brass, and plain carbon steel.

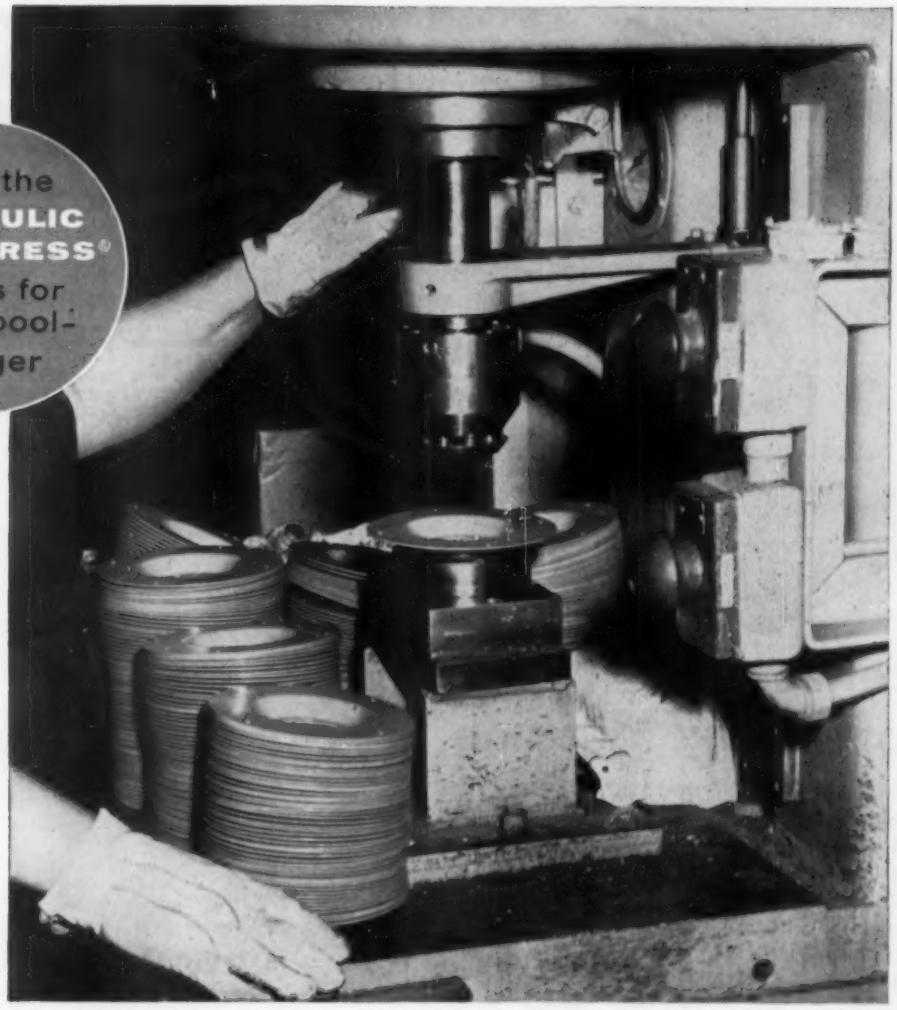
25 cents a copy

READER SERVICE DEPT.

American Machinist

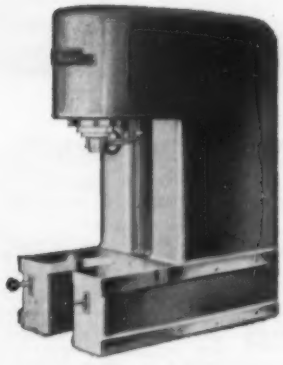
McGraw-Hill Building
New York 36, N. Y.

How the **HYDRAULIC MULTIPRESS®** works for Whirlpool-Seeger



MULTIPRESS®

assembles automatic washer parts daily...by the thousands



8-ton Denison hydraulic Multipress

All automatic washers, made at the rate of several thousand per day by Whirlpool-Seeger Corporation, require a stamped steel brake disc.

Rivets assemble the stamped discs to flanged hubs die cast in zinc alloy. The two parts are positioned together, rivets passed through small holes in the bottom of the stamping, projecting inside the dished portion of the disc. The four rivets are then upset, fastening the brake disc permanently to the hub.

With the 8-ton Denison hydraulic Multipress, the riveting operations are performed with perfect uniformity. Smooth, controlled hydraulic action of the ram avoids a sharp blow, yet applies the proper pressure to the rivets.

Your Denison representative can show you how to improve your manufacturing operations, increase quality, cut production costs. Write Denison Engineering Division, American Brake Shoe Co., 1164 Dublin Road, Columbus 16, Ohio.

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

DENISON Hydr OIL ics

Centerless Microfinishing Machine

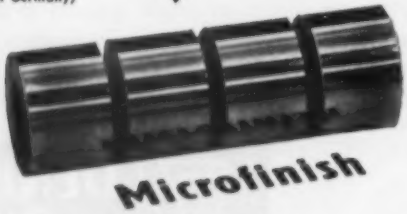
You can economically microfinish series and mass-produced parts in continuous or plunge-cut process with precision centerless THIELENHAUS MICROFINISHING MACHINES. Other models are available for your every microfinishing need.

Send sample for free processing without obligation!

Surface finish of a roller bearing part after fine grinding and polishing, according to Forster (Vh = 1200, Vt = 100)

Same sample after few seconds of microfinishing on THIELENHAUS MICROFINISHING MACHINE.

MASCHINENFABRIK
ERNST THIELENHAUS
WUPPERTAL-BARMEN
(Western Germany)



Microfinish

Write for free MicroFinish Leaflet AM346
Sole representatives in USA wanted.

SPECIFY GRIPCO LOCK NUTS

to resist stress, wear and vibration

They increase product durability at low initial cost

Simple one piece design — no inserts — no outside devices. Nothing complicated — the Gripco locking action is within the nut itself, yet you get low initial cost and low application cost with increased customer satisfaction. Speed production and lower manufacturing costs on your products now.

Send for samples and full particulars.

Gripco Products Include:

Gripco Lock Nuts • New Gripco "Clinch Nuts"
Gripco Hi-Nuts • Gripco Pilot-Projection and Countersunk Weld Nuts

all with or without the famous Gripco positive locking feature. Also Standard Semi-Finish Nuts.

115

GRIP NUT COMPANY
102 Broad St. • South Whitley, Ind.

Write for list of Special Reports currently available from

Reader Service Department

AMERICAN MACHINIST
McGraw-Hill Bldg., New York 36, N. Y.

POPE SUPER-PRECISION BORING MACHINE
Bores Holes Round Within Millionths

Table actuation all electrically controlled
Feed and traverse rates infinitely variable

Write for Bulletin S-9

POPE MACHINERY CORP. • *Est. 1920* • HAVERHILL, MASS.
BUILDERS OF POPE PRECISION SPINDLES

RUSSELL
HYDR. SAWING MACHINES

All sizes up to 14" capacity, with and without automatic stock feed

Ask for catalogs

TRIPLEX MACHINE TOOL CORP.
75 West St. New York 6, N. Y.

PALMGREN

Drill Press and Angle Vises

Used in all Industries – Everywhere

There are 64 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories – the most complete line of vises and tables available anywhere.

Write for Catalog 264

No. 14 4" Drill Press Vise For Milling, Drilling, Grinding, $10.95

No. 248 4" Angle Vise With Swivel Base For Quick, Accurate Angle Set-ups $39.95

CHICAGO TOOL AND ENGINEERING CO. 8383 S. Chicago Ave., Chicago 17, Ill.

the ALL-AROUND VERSATILITY

PLUS values in power

of the HOWELL series one hundred motor line

gives you A WIDE RANGE OF MOUNTINGS AND ELECTRICAL CHARACTERISTICS TO FILL YOUR PARTICULAR MOTOR NEEDS

TOTALLY ENCLOSED FAN-COOLED

OPEN DRIP-PROOF

To meet your job requirements exactly, the new Howell Series 100 motors are available in each of the five standard constructions illustrated here. And under their streamlined good looks lie a wealth of "plus values" in construction that make these rerated motors your best buy for long range dependability.

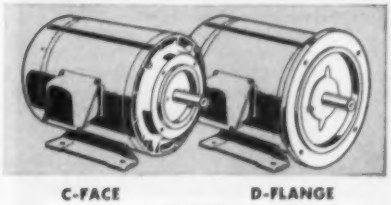
Beyond mountings, there's a broad range of electrical types and mechanical combinations that are accommodated readily by the basic Series 100 design. A partial list is as follows:

Normal torque
High torque, compressor duty
Punch press, elevator and crane hoist
Multi-speed
Reluctance synchronous
Single phase
Torque motors
Brake motors
Part Winding
Rapid reversing
Special application
Gear motors

SPLASH-PROOF and WEATHER-PROTECTED

TOTALLY ENCLOSED NON-VENTILATED

EXPLOSION-PROOF
(available soon)



C-FACE D-FLANGE
P-BASE

For more details on Series 100 motors, write for Bulletin N-100-R

HOWELL MOTORS

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

NOW!
new
economies in
NYLON GEARS
means savings in gear costs up to 90%

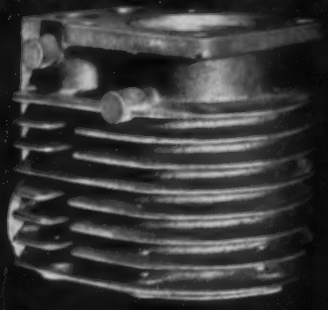
Our many years of pioneering and successful production of Nylon Gears, plus new reduced mold charges, can now make even greater economies for you in the use of Nylon Gears. With the great variety in molds now possible, Nylon should not only be considered as an economy measure but the answer to many problems where a compact design is necessary. Nylon Gears are quiet, durable, efficient and need less lubrication – they mate perfectly with metal gears.

Let our engineers with more than a decade in gear experience show you how Nylon Gears can save you money – let us consider your gear problems during the design process–send blueprints or specs for prompt estimates.

105

PROCESS GEAR CO., INC.

USER SAYS TAP LIFE UP 43% ON THIS THIN-WALLED CASTING



...thanks to
FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 16, Niagara Falls, N.Y.

CARBORUNDUM®

NEW

ERICKSON

MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

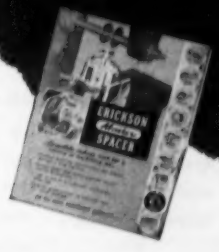
straddle milling

milling

jig drilling
with either micrometer or "Jo" block setting

inspection

Write for free catalog "Erickson Master Spacer" today. And at the same time request your copy of Catalog K; you'll find cost-slashing applications for all Erickson holding tools.



The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

The new Erickson Master Spacer, ideal for tool room and production machining, assures outstanding performance under heavy helical cuts and slow feeds. *Indexing accuracy guaranteed within .001-inch cumulative error on a 6-inch diameter circle.* Jig drilling is possible with either micrometer or "Jo" block setting. Timken bearing construction permits work to be trued in position with brake off because spindle alignment remains unchanged.

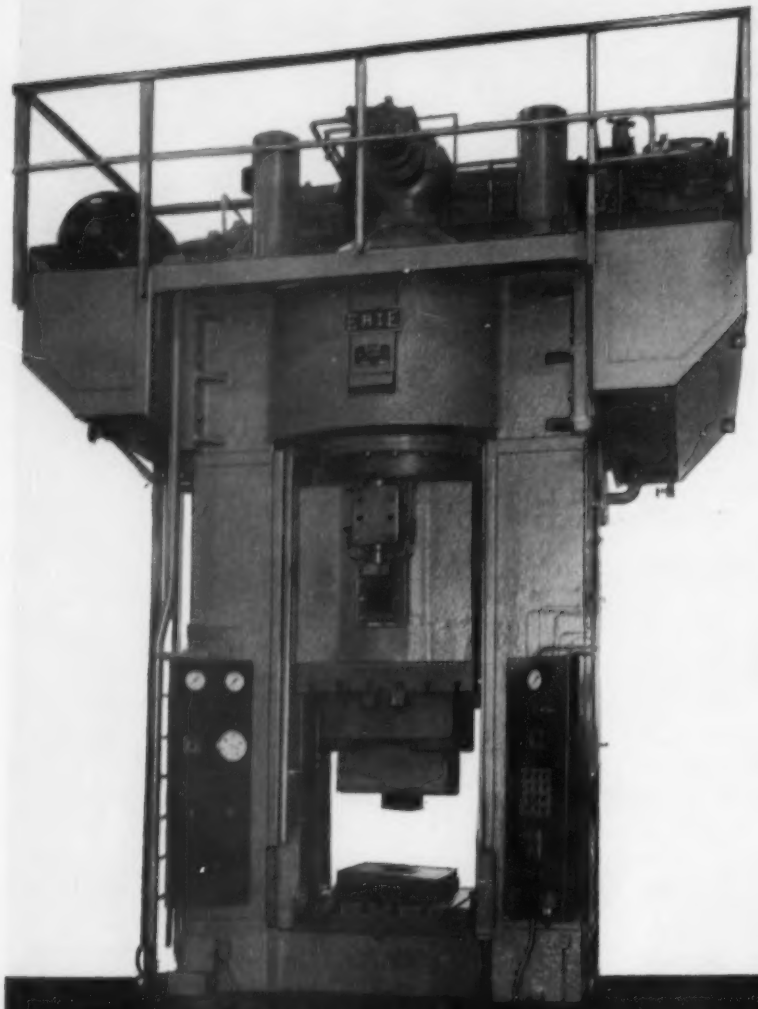
The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

AA-8091

ERICKSON TOOL COMPANY

2309-11 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES



ELECTRO-MAGNETIC CONTROL

All controls are grouped on one accessible control panel which allows delicate finger-tip control by the operator . . . the machine responds *instantly*. This control allows any speed of ram travel in either direction.

SEMI-AUTOMATIC OPERATION

The forging cycle can be pre-set to incorporate any speed and tonnage—advance, press, slow return, fast return.

REMOTE MANUAL CONTROL

Manual control is easily detached from the control panel by the operator who is free to control the press from any nearby position.

HYDRAULIC TOP & BOTTOM STRIPPERS

Can be set to eject the forging from the die at *any* position.

NEW ADJUSTABLE GUIDES

Insure accurate platen alignment and *requires no shimming*. Adjustment can be made in less than an hour.

ERIE FOUNDRY'S NEW HYDRAULIC PRESS

with electro-magnetic control

produces precision forgings

1500-TON FORGING PRESS

platen size:	48" x 48"
opening:	60"
stroke:	48"
speeds—advance:	400" per minute
press:	adjustable from 0" to 52" per minute
slow return:	adjustable from 0" to 52" per minute
fast return:	360" per minute
hydraulic components:	Oilgear with Raytheon Servo-control

The Erie Foundry Hydraulic Forging Press was specially designed for no-draft non-ferrous forging. Modifications of this rigidly built, self-contained machine can be supplied to your forging requirements. For more information, please write.

ERIE

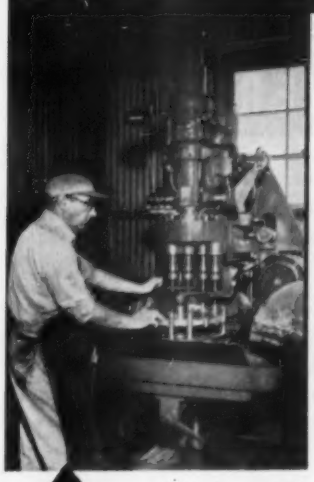
Hydraulic Press Division

ERIE FOUNDRY CO.

ERIE, PA.

GREATEST NAME IN FORGING MACHINERY SINCE 1895

Thompson Products Inc. | **West Coast Division**



tapping production DOUBLED in pieces per hour with longer tool life

KAUFMAN

There's a good reason for that kind of a [illegible] d. *Kaufman specializes in building tapping machines . . .* highly-precisioned machines designed for high production runs or for the versatile, multiple machine shop requirements. For complete information on how you can reduce production costs in your plant . . . send prints and samples of your work to

KAUFMAN MFG. CO.
543 S. 29th St. Manitowoc, Wisconsin

M&M giant keyseaters

M & M Giant Keyseaters cut internal keyways or splines in the bores of pulleys, gears, flywheels and other machine parts. Fast, accurate operation. Built in a wide range of sizes. Special fixtures and cutters available for unusual shapes and taper work. Write today for complete information.

MITTS & MERRILL
104 Holden Street • SAGINAW, MICHIGAN
83

SEARCHLIGHT SECTION

REPLIES (Box No.) Address to office nearest you
c/o this publication Classified Adv. Div.
NEW YORK: P.O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P-9590, American Machinist.

Machine Shop Foreman well established producer and fabricator of welded steel tubing has opening for aggressive experienced machine shop foreman. Duties include design and production of all tools, rolls, bending dies, and gauges, and special equipment. Good salary and benefits. Write P-3215, American Machinist.

SELLING OPPORTUNITY OFFERED

Sales representatives and dealers for carbide reamers and form tools. Nationally advertised company. Wide choice of exclusive sales territories. RW-3282, American Machinist.

SELLING OPPORTUNITY WANTED

Experienced New York Machine Tool Salesman with practical tool design & shop experience seeks lines. RA-3226, American Machinist.

SALES-SERVICE ENGINEER

Machine tools—travel required—excellent opportunity—salary commensurate with ability & experience. Reply stating full details to

P-3274, AMERICAN MACHINIST
Classified Adv. Div., PO Box 12, NY 36, NY

HILL-CLARKE **BEST BUY OF THE MONTH**

BEST BUY OF THE MONTH

No. 18 Blanchard Vertical Surface Grinder, 30" Magnetic Chuck, 35 H.P. 440-3-60 Motor Drive, 2 H.P. A.C. Table Motor Drive, Work Range 30" x 12", 18" Dia. Wheel Speed 720 R.P.M., 6 Chuck Speeds 6-32 R.P.M. Wheel raised or lowered by hand or power, Serial #2658. OUR PRICE $4950.00.

PARTIAL LISTING
BORING MACHINES

Foote-Burt Vert. 20" sw, new 1941
#49 Heald Barcomatic, new 1944
3½" Bar Cinn-Gilbert Table Type
3½" Bar Cinn.-Gilbert Floor Type

DRILLS

1 spdl. 14" sw, #2 Avey, new 1945
1 spdl, 20" sw, #2LMS L-G, 1945
1 spdl, 24" sw, #2MA6 Avey, new 1942
1 spdl, 26" sw, #4MS L-G hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 20" sw, #2LMS L-G, 1942
3 spdl, 24" sw, #3MS L-G, new 1943
4 spdl. 14" sw, #2LMS L-G, new 1943
6 spdl, 20" sw, #2LMS L-G, new 1943
#214-A Baker Univ. H.D., 1943
16 spdl. Fox #K80H, #3 taper, 1944

GRINDERS

3"x12" #5 B&S, 1942
3"x18" #5 B&S, 1943
4"x12" #4H Landis, New 1943
6"x18" Norton Type C, new 1943
10"x19" Norton Type C, new 1943
10"x36" Norton Type C, new 1942
10"x48" Norton Type C, new 1943
10" (28" sw.) x 48" Cinn. EB, 1943
10"x50" Hill-Clarke, AC Mot. Dr.
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
10"-20"x36" Norton, angular wheel
14"x72" Norton Type C, new 1941.
14"x96" Hill-Clarke, A.C. Mot. Dr.
16"-40"x96" Norton Gap, 1942
16"x72" Hill-Clarke, A.C. Mot. Dr.
16"-26"x72" Norton, AC MD 1941
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton, AC MD
24"x264" Norton, AC MD, Rebuilt
26"-32"x144" Norton Pl. Cyl
42"x72" Norton, extras, new 1947
#6A Bryant Internal, new 1948
#16A-16 Bryant Internal, new 1943
#16-36 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#34-36 Bryant Internal, new 1941
#72AS Heald Int. Sizematic, 1944
#72AS Heald Internal, new 1943
#72AS Heald Bridge Type Int.
#214 Besly Double End Disc. 1940
2B Abrasive Surf, 8"x24", 1943.
#18-36" Blanchard Rot. Surf.

LATHES

16ML-16"x36" LeBlond Auto.
12"x36" Hendey Lathe, Taper Att.
12"x28" Lipe Carbo Semi-Auto
12"x32" Fay Automatic
13"x48" Fay Automatic
14"x30" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
24"x42" Fay Auto. AC MD
30"x120" Putnam Grd. Hd., MD
K14 Seneca Falls, 16"x30", 1942
120"x96" or N-B-P, new 5289
#8W Cinn Arma Univ. Turret
#4 Gisholt Univ. Tur. A.C.&D.P.
#3H-10 Libby H.D. Tur. 1943
#4A W&S Turret
4FU Fastermatic, tur, 32" sw, 1944
#D Potter & Johnston, new 1941

MILLERS

54"x30"x16 Ingersoll Slab, 1934
54"x60"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rotary
#6V Davis & Thompson Vert., 1944
#12-B Pratt & Whitney Profilers
10"x60" P&W Mod. B. Thread Mill
#1/2 6"x12" L B Thread
#CT L-B Thread Mill new 1943
No. 2 Cinn. Univ. Hi-Power
#114 Van Norman Prod. 1942

PLANERS

36"x36"x12' Rockford Openside '42
60"x48"x27' American, 4 hds.
60"x48"x30' Hamilton, 4 heads

MISCELLANEOUS

6" Goss & DeLeeuw 6 spdls. 1941
#206 Barnes Vert. Hone, new 1942
15 Ton Hyd American Press, 1946
#11BD 2 Hd. W&S Tapper, latest
#36HM G&E 3 Spdl. Bevel Gear
612-A Fellows Gr Shaper 18" cam
#HR8 Barber-Colman Sharp Mach
15 Ton Toledo Overhd. Crane, 59½'

HILL-CLARKE MACHINERY COMPANY 2106 S. KILBOURN AVE., CHICAGO 23, ILL.
PHONE: CRawford 7-2000

Gaging . . .

the Surplus Machinery Market

How's business? You can get almost any story you want, depending on who you talk with. It depends on the dealer's stock of good-quality machine tools, on whether the type of customer he generally serves is doing a booming business or just so-so, on his political views, and his inherent optimism.

But you do get one or two universal reactions. For one, good-quality machines and fabricating equipment are in high demand almost everywhere. For another, virtually every dealer agrees that auction prices are far too high. In fact, more than one dealer has said recently, "We're our own worst enemies. We're pricing ourselves right out of the market by overbidding at private auctions and government sales."

That may be true, but what can the dealer do when buyers from metalworking firms get "auctionitis" and bid sky-high prices for pig-in-a-poke machines? Time after time, dealers report seeing untested machines go for top prices, while they have identical ones sitting in their salesrooms at lower prices—guaranteed, too.

Price troubles or no, most dealers report that the summer lull is definitely over and business has picked up as much as 10% since July and August. True, the tight money market seems to be holding back buying somewhat, but it, too, has its brighter side—the used machinery dealers who have rental plans with low monthly payments are doing a landoffice business.

It seems that the surplus machinery dealers who have large, blue-chip metalworking firms on their books as customers are doing better these days than dealers who rely on the smaller shops. For one thing, the big firms are least affected by the tight money market. For another, most of the larger outfits set aside their expansion and tool buying money quite a while back, and they'll carry out their plans in spite of tight money.

The consensus: fourth quarter business is running well ahead of the third quarter, and the outlook for at least the beginning of '57 is very favorable. Biggest dark clouds on an otherwise sunny business horizon: tight money, narrowing profit margins, a tendency to overcompete for good machines.

With an eye to Florida's mushrooming industrial expansion, one of the East's biggest surplus machinery dealers, J L Lucas & Sons of Fairfield, Conn, is setting up Lucas Machinery Service in Miami. Says Lucas' sales manager Ray Whittles, "At the moment we're just feeling our way along down there. We expect to have rough sledding for a while, but some mighty big metalworking plants are moving into Florida, and when they start looking for machines, we'll be ready for them." Lucas, which has one of its men, I T Gavlick, laying the groundwork for its Florida operation, plans to warehouse machines in Florida by the time the boom gets going.

Incidentally, the recent tremendous sale of machine tools from Studebaker-Packard's Grand Blvd plant in Detroit had nothing to do with Stude-Packard at the time of sale. It seems the entire lot of hundreds of machine tools had been sold previously to the highest bidder, Adams Machinery Co of Chicago, which in turn offered the tools to the public in a weeks-long, on-the-premises sale.

United
EVERY TIME!

DRILLS
CANEDY-OTTO 21" 2-Spindle Box Column
CANEDY-OTTO 21" Round Column Sliding Head
CANEDY-OTTO 4'11" 8-Speed Radial
LELAND-GIFFORD 2 LMS—28" 3 Spindle

GEAR EQUIPMENT
BARBER COLMAN Type S Hobber
FELLOWS 12" Helical & Spur Shaver
FELLOWS 64A Int. & Ext. Spur—1943
GLEASON 12" Straight Bevel Generator

CYLINDRICAL GRINDERS
NORTON 14"x36" Type C Plain—1942
NORTON 10"x36" Type C Semi-Auto.—1947
CINN. 6"x18" Model ER Semi-Auto.—Filmatic
B & S #1 Univ.
NORTON 6"x30" Type C Hyd. Plain

SURFACE GRINDERS
COVEL #20 6"x18" Hor. Hydr.
NORTON 6"x18" Hor. Hydr.
NORTON 6"x18" Vert. Hydr.
THOMPSON 12"x16"x60" Hydr.

ENGINE LATHES
AMERICAN 36"x60" High Duty—1940
REED PRENTICE 20"x72" 16-Speed
AMERICAN 12" x 30" High Duty

TURRET LATHES
B & O #7 2½" Chucking
B & O #2 1" Geared Electric Head
GISHOLT #4 2" Bar & Chuck
GISHOLT #3 1½" Bar
GISHOLT #5 2½" Ram Bar

MILLERS
B & S 2B Hi-Speed Plain
B & S 3B Hi-Speed Plain
K & T H Plain
K & T 3H Vert.
K & T 5H Plain
K & T 2HL Swivel Hd. Vert.
VAN NORMAN #22LU Univ.

PRODUCTION MILLERS
CINN. #08 Plain
CINN. #08 Vert.
CINN. #2—18 R & F Cam Roller
CINN. #4-36 Hydromatic, 2-way cycle
K & T 18-54 Simplex

MISCELLANEOUS
GRAY 36" x 36" x 12' Double Housing Planer—1942
INGERSOLL 42" x 42" x 14' Double Housing Adj. Rail Planer Type Milling Machine, 4 Heads—1940
LaPOINTE HP 5 2½ Ton Hor. Hydr. Broach—1947
BRYANT 5A CHUCK TYPE Int. Grinder
NEW BRITAIN #61 6-Spindle 1⅛" Automatic Screw

United
MACHINERY & TOOL
CORPORATION
83 THOMAS STREET
WORCESTER 8, MASS.

MACHINE TOOLS

For Half A Century

New • Used • Rebuilt

MOREY

GEAR EQUIPMENT—HOBBING

BARBER COLMAN Type A; cap. 12" x 12" 3 D.P.
BARBER COLMAN #3 Gear Hobbing Machine; cap. 8" - 12" D.P., late type
BARBER COLMAN Type S Auto. Gear Hobbing Machine #1 1" dia. Brass 24 D.P., steel 32 D.P.
BARBER COLMAN Type T; 12" x 12" cap.; 3 D.P.
BARBER COLMAN Model 8-10 Model (type V) Vertical; cap. 3"; 4½ D.P., late type
BARBER COLMAN #12 single overarm; 12" x 12" cap., M.D.
BARBER COLMAN #17 cap. 8"; 2½ D.P.; M.D.
GOULD & EBERHARDT #8H Universal; cap. 12"; 4 D.P., M.D.
GOULD & EBERHARDT Model 24-H Universal 27" cap.; 3½ D.P., late type
GOULD & EBERHARDT 12H Heavy Univ. cap. 12"; 4 D.P., M.D.
GOULD & EBERHARDT #24-H; cap. 14"; 3½ D.P.
HERCULES 8" Gear Hobbing Machine, M.D.
KOEPFER Model WM-11 Automatic Gear Cutter; 24 D.P., late type

LATHES, MANUFACTURING

BLOUNT 12" x 8' Centers Polishing Lathe; late
BLOUNT 20" x 60" Centers Polishing Lathe; Model B3; late type
BLOUNT Model B-2 12" x 48" Centers Pedestal Mounted Polishing Lathe; late type
GISHOLT #12 Hydraulic Automatic 13" swing; late
H.E.B. 17" x 40" Centers High Speed Hyd. Copying Lathe; late type
JONES & LAMSON "FAY" 20" x 28" Centers Auto.; late type
LEBLOND Model 7AC Crankshaft Turning; late type
LEBLOND #16, 16" x 36" Centers Automatic Turning; late type
LEBLOND 25" x 54" Centers Heavy Duty Rapid Prod.; late type
LEBLOND 42" x 26' Bed Single End Boring Lathe
LIPE "CARGO" 12"x18" Centers Production Lathe; late type
LODGE & SHIPLEY #5 x 24" Centers Duomatic Auto; late type
LODGE & SHIPLEY #5 x 96" Centers Duomatic Auto; late type
LoSWING (SENECA FALLS) 4" x 60" Automatic
LoSWING (SENECA FALLS) 4" x 84" Automatic
LoSWING (SENECA FALLS) 8" x 100" Automatic
MONARCH 14" x 42" Centers Model Z Single End Mag. Auto.; late type
NILES 30" x 25' Bed Boring Lathe; late type
PRATT & WHITNEY 7" x 16" Centers Bench Lathe
SUNDSTRAND Model 12" x 22" Automatic Chucking
NILES 30" x 50' Bed Single End Boring Lathe, late
L & G 33" x 10' Double End Crankshaft Polisher

GRINDERS, PLAIN CYLINDRICAL

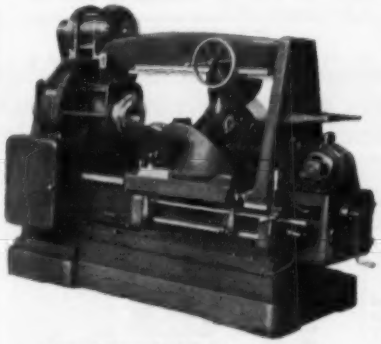
CINCINNATI 4" x 12" Centers Model OH "Fil-matic"; New 1950
LANDIS 4" x 12" Centers Type H Hyd., late type
LANDIS 4" x 18" Centers Type H Hyd., late type
LANDIS 6" x 18" Centers; M.D.
LANDIS 10" x 18" Centers Type C Hyd., late type
LANDIS 10" x 36" Centers Type DC Heavy Hyd.
LANDIS 10" x 36" Centers; M.D.
LANDIS 10" x 72" Centers Type DC Heavy Hyd.
LANDIS 10" x 96" Centers Type C Hyd., late type
LANDIS 10" x 120" Centers, Type B; late type
NORTON 4" x 12" Centers Type CTU Hyd., New 1951
NORTON 10" x 18" Centers Type C Hyd.; late type
NORTON 10" x 36" Centers; Meter Drive
NORTON 10" x 48" Centers Type C Hyd.; late type
NORTON 14" x 72" Centers Type C; late type
NORTON 14/22" x 36' Centers Type C "Gap Type"
NORTON 16" x 48" Centers Type C; late type

GRINDER, SURFACE

ABRASIVE #1½; 10" x 10" Hand Feed; late type
ARTER 8" Automatic Ring Grinders; M.D.
BILLITER & KLUNZ Type BS 5680 Way Grinder; 48" x 196" cap; late type
BROWN & SHARPE #2; Cap. 6" x 18"; late type
HEALD #22 Rotary Surface Grinder 12" Chuck; M.D.
HEALD #23A Rotary Surface Grinder 30" Chuck Hyd.; M.D.
MATTISON 14" x 10" x 60" High Power "Precision" Hyd.; late type
MATTISON 14" x 24" x 72" High Power "Precision" Hyd.; late type
MATTISON 16" x 24" x 120" High Power "Precision" Hyd.; late type
NORTON 6" x 18" Horizontal Spindle Hydraulic; late
NORTON 6" x 18" Vertical Spindle Hydraulic; late
PRATT & WHITNEY 14" x 36" Vertical Spindle Hydraulic; late type
BLANCHARD #16, 20" Magnetic Chuck; M.D. hyd.; late type
BLANCHARD #16, cap. 36" x 12"; 36" Magnetic Chuck; late type
BLANCHARD #18, 42" dia. Magnetic Chuck; New 1956
GALLMEYER & LIVINGSTON #45 cap. 12" x 24"

GRINDER, INTERNAL

BRYANT #16-CP-16 Internal; max. swing 13"; stroke 16"; late type
BRYANT 16-36 Internal; max. swing 38"; stroke 11½"; late type
BRYANT #24 Internal Grinding Machine; late type
BRYANT 24-L-26 Heavy Duty Hyd., Max. Swing 26"; max. stroke 27"; late type
BRYANT 112-Y Hydraulic; max. swing 16"; max. stroke 20"; late type
CHURCHILL #3 Internal Cylinder; cap. 22" x 48"
HEALD #70A Plain; max. swing 15¼"; max. stroke 7½"; late type
HEALD 72A3 "Gagematic" Hyd. Grinder, max. swing 22"; max. stroke 8⅝"; M.D.
HEALD #73 Hydr. Plain; swing over table 10"
HEALD 72A3 Plain Hyd. Grinder; max. swing 15½"; max. stroke 8⅝"; late type
HEALD #81 Plain Chuck Type Hyd. max. swing 15"; late type
HEALD #81 "Sizematic" Chuck Type Hyd. max. swing 15"; late type
HEALD #78 Centerless Hyd. Cap. 5" to 13"; O.D. x 16" long; late type



BARBER-COLMAN No. 17 Gear Hobbing Machine; cap. 8"; late type

CASH • CREDIT
RENTAL • TRADE-IN

MILLERS VERTICAL

BROWN & SHARPE #2, Dial Type; table 10" x 50"; Swivel Head; late type
CINCINNATI #0-8; Table 20" x 6"; late type
CINCINNATI #2M; Table 10½" x 52¾"; late type
CINCINNATI #3 Model ER; dial type; Table 62½" x 15¼"; late type
CINCINNATI #4 Model ER; dial type; Table 78½" x 16¼"; late type
GRAY #10-R Ram Type; table 9" x 36"; late type
KEARNEY & TRECKER (MILWAUKEE) Model 2KM; table 58" x 10"; late type
KEARNEY & TRECKER (MILWAUKEE) Model 4H; Vertical Milling Machine; table 74" x 15½"
KEARNEY & TRECKER (MILWAUKEE) #2H; table 50" x 10"; late type
KEARNEY & TRECKER (MILWAUKEE) #4K; table 82" x 18"; late type
PRATT & WHITNEY #3 Die Sinker, rotary table
REED PRENTICE #5 Bed Type Vertical Miller & Die Sinker; Table 66" x 10"; late type

MILLERS PLAIN

BROWN & SHARPE #2 "Light Type" Table 10" x 50"; late type
BROWN & SHARPE #12 Prod. Type; Table 12" x 48⅝"; Long Feed; late type
CINCINNATI 2-24 Prod. Type; Table 42" x 11"
CINCINNATI 2-24 Prod. Type; Some with Auto. Rise & Fall Spindle
CINCINNATI 5-48 Hydromatic Milling Machine; late
CINCINNATI 4 Dial Type; table 80" x 18"; late
CINCINNATI 60" x 48" x 18" Planer Type; 4 motor-driven heads; late type
CINCINNATI #2M; table 40" x 10½"; late type
INGERSOLL 52" x 24" x 16' Bed Planer Type, 5 Heads; late type
KEARNEY & TRECKER (MILWAUKEE) #4 Model CSM; Table 74" x 15½"
KEARNEY & TRECKER (MILWAUKEE) #2H Table 50" x 10"; late type
KEARNEY & TRECKER (MILWAUKEE) Model 2B
KEARNEY & TRECKER (MILWAUKEE) #3K; table 64" x 15½"; late type
KENT OWENS Hand Miller; table 22" x 9"; M.D.
ROCKFORD #3 "Rigidmil" Table 14⅝" x 30"
STARR #2 Table 12⅞" x 30"; late type
SUNDSTRAND #33 Simplex Fluid-screw "Rigid-mil"; table 14" x 78"; late type

MILLERS, PROFILE AND DUPLICATING MACHINES

CINCINNATI Vertical Hydrotel 28"/10"/60" High Power Auto. Depth Control; table 28" x 143" Longitudinal feed 120"; late type
MOREY 12M 2-Spindle Vertical Profiler & Milling Machine; table 12" x 15"; late type
PRATT & WHITNEY GG "Keller" Auto. Toolroom Machine; table 18" x 18"; horiz. travel of column 12"; Vertical travel head 10"; late type
PRATT & WHITNEY Model BL-2416 "Keller" Auto. Tracer Control; 2-dimensional; table 22" x 42"; late type
PRATT & WHITNEY Model BL-2416 "Keller" Auto. Tracer Control; 3-dimensional; table 22" x 42"

PRESSES

BALDWIN-LIMA-HAMILTON 4500 ton Forging Press; latest type
BIRDSBORO 325 ton Vertical Hydraulic; late type
BLISS #410-A, 525-ton Drawing Press; Bed 66" F-to-B; 76" R-to-L; M.D.
BLISS #56 straight side; late type
BLISS #95 Straight side
BLISS #73½ Straight side
BLISS #75½ Straight side
BLISS #26 Knuckle Joint; late type
CHAMBERSBURG Horizontal Hyd. Straightening; 500 H.P. Billet Breaker; late type
HANNIFIN #B-200 Air-Operated Arbor; late type
NATIONAL #5 "Maxi-Press" High Speed Forging; 1,000 ton; M.D.
NIAGARA Model 66-E Double Crank Power; Bed 42" x 72"; M.D.
WATERBURY FARREL #9 Straight Side Blanking; 125 tons; M.D.
V & O #3 Open Back Inclinable; 30 tons; bed 15¼" x 21¾"; late type
WATSON STILLMAN 150 Ton Wheel Press; M.D.
MASSILLON #6 Straight side
MASSILON #5 Straight side

PLANERS

DETRICK & HARVEY 48" x 48" x16' Double housing; Hyd.; 4 heads; M.D.
GRAY 40" x 40" x 10' Double housing; 4 heads; D.C.; M.D.
LIBERTY 144" x 76" x 48' Convertible openside; 6 heads; vari-voltage
NILES 46" x 46" x 10' Double housing; 4 heads; D.C.; M.D.
NILES BEMENT POND 60" x 60" x 14'; Double housing; 4 heads; D.C.; M.D.
NILES BEMENT POND 72" x 72" x 36' Double housing; 4 heads; vari-voltage; M.D.
NILES BEMENT POND Horizontal, 36" x 36" x 14' Double housing; 4 heads; M.D.
SELLERS 48" x 48" x 14' Double housing "Power-Fin"; 4 heads; D.C.; M.D.
SOUTHWARK #1 Horizontal Plate Edge; cap. 1½ x 16 ft.; M.D.

PARTIAL LIST, Ask for catalog! FREE PARKING for CUSTOMERS on PREMISES

MOREY MACHINERY CO. INC.

MANUFACTURERS • MERCHANTS • DISTRIBUTORS OF MACHINE TOOLS

387 LAFAYETTE STREET — NEW YORK 3, N.Y.
TELEPHONE—ALGONQUIN 4-6560 — CABLE-WOODWORK N.Y.

BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

LATHES

24" x 12' BOYE & EMMES Grd. Head, Timken Bearing, Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking, Late Type.

17" x 8' LeBlond Regal Grd. Hd. Lathe, M.D.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 4', 5', 6' CINCINNATI BICKFORD Radial Drills.

6 Spindle No. 2 LMS Leland-Gifford Drill Press. Late Type.

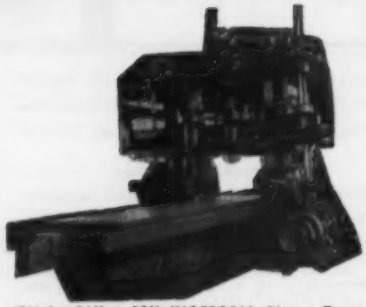
No. 2 M. T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive. Late Type.

MILLS

No. 2HL Kearney & Trecker Horiz. Mill, M.D., Late Type.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

1A PRATT & WHITNEY Jig Borer, with Gauges, Rods, Collets and Chuck.



42" by 36" x 12" INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

48" CINCINNATI Duplex Automatic Prod. Mill, M.D.

No. 2, 3, 4, 5 CINCINNATI Hi Power Horiz. Mills, M.D.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Drives.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder, Complete Tooling.

4' x 12' LANDIS Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 W HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, M.D. Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine, Detachable Head, Univ. Work Support.

No. 1, BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, M.D. Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine. M.D., 2" Capacity.

8' x 18 Ga. Wysong & Miles Foot Shear, Late Type.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

12" PRATT & WHITNEY Vertical Shaper, Keller Attachment. Late Type.

12" ROCKFORD Hydraulic Vertical Shaper. 1953.

14" Jones & Lamson Comparator, Late Type.

15' x 10' x 36' BETTS Double Housing Planer, 4 Swivel Heads, Pendant Control, Box Table, Motor Driven.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

HD MACHINE TOOLS

Serving the World's Largest Manufacturers

#42 Heald Two Spindle Single End Boromatic Serial #11137.

Late Type No. 2 Cincinnati Dial Type Universal High Speed Miller Serial 4A2U1P-50

48" x 48" x 12' Cleveland Heavy Duty Openside Planer

#300 Hanchett Vertical Surface Grinder Serial #300-17.

MONA MOUNTED

NEW - USED REBUILT MACHINERY

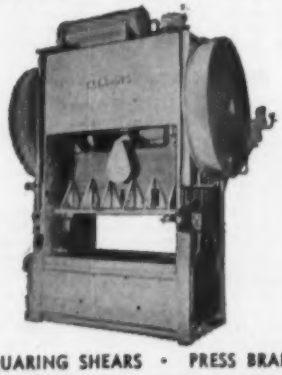
HAZARD BROWNELL MACHINE TOOLS INC.

350 WATERMAN STREET PROVIDENCE 6, R. I. DEXTER 1-8880

WORLD'S LARGEST STOCK

STAMPING PRESSES

BLISS • CLEARING • CLEVELAND
FERRACUTE • HAMILTON • L & J
NIAGARA • TOLEDO • V & O



SQUARING SHEARS • PRESS BRAKES

REBUILT *and* GUARANTEED

JOSEPH **HYMAN** & SONS

TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34 PA. Phone GArfield 3-8700

NEW "WYSONG" SQUARING SHEARS

IMMEDIATE DELIVERY FROM OUR STOCK!

#1010 WYSONG
10' x 10 GAUGE

#1025 WYSONG
10' x ¼"

PRESS & SHEAR MACHINERY CORP.

2600 E. TIOGA • PHILADELPHIA 34, PA. • GA 6-8840

ELECTRIC FURNACES TO 1850F
with Auto Temp Control. Sliding door, heavily insulated, substantial, accurate, dependable for machine shop, tool room, laboratory Now
8"x12"x15" inside 4.5 K.W. $360.00
12"x16"x20" inside 9.0 K.W. $500.00

E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

Follows No. 4B Burnisher.
Nos. 5G & C12 Natco Multi-Drills.
Gleason 3" Str. Bevel Gear Generators.
K & T No. 3B Plain Mill, vert. attach. MIB.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

FOR SALE

#4 Cincinnati Centerless Grinder #3M4H1K (Fil-matic)
#33L Excello Thread Grinder #1383
#30A Excello Internal and External Thread Grinder #9185
Bundstrand Plain Duplex Milling Machine, Model #30FM1813D, Ser. #98-285 (10 ft. table). Write

ALBERT TOOL & GAGE CO.
2301 Harrison Kansas City 8, Mo.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

AUTOMATICS

9/16" Cleveland Model A, m.d., 1943
Model B1—1/16" Cleveland, m.d.
4 spindle 1⅝" Cleveland model M, m.d.
4 spindle 2" Model K Cleveland, m.d.
4 spindle Model RAS National Acme-Acme Gridley, 2" Cap., m.d.
2" Cleveland Model A, single spindle, m.d.
2½" Cleveland, m.d., Model A
No. 8A Cleveland, m.d., 8" cap., latest
No. 4D Potter & Johnston, m.d.
No. 5 DELX Potter & Johnston, m.d., late

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅜" to 2" nuts
1½" Landis 2 spindle, m.d.
1½" Landis Stay Bolt Threading Machine, Double Head, m.d.
No. 326 Oster Bolt & Pipe Threading Machine, m.d.

HORIZONTAL BORING MILLS

No. 1 Cleveland Horizontal Boring, Drilling & Milling, m.d.
5½" bar Betts Floor Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Sellers Floor Type, m.d.
8" bar Barrett No. 6 Horizontal Cylinder, m.d.
10" bar Sellers Floor Type, m.d.
No. 25T Giddings & Lewis, m.d., late
Barrett Double End, 7" and 5" spindle, m.d.
Floor Plates—all sizes

VERTICAL BORING MILLS

16" Bullard Mult-Au-Matic, m.d.
24" Bullard Spiral Drive, 1943
42" Bullard New Era, m.d.
42" King, direct m.d. thru gear box
42" King with side head and plain swivel head on rail, 1948
44" Putnam, m.d., p.r.t.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
53" Niles Pattern, vee belt m.d., latest
102" Niles Wheel Turning Boring Mill

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke Lapointe Single Ram Vertical Surface Broach, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dup. Ram Surface Hydr. Broach
No. 3 Oilgear Hydraulic Broach, type XA, 54" stroke, m.d.

RADIAL DRILLS

4'-11" col. Morris Mor-Speed Plain
5'-13" col. American, m.d. on arm
5'-14" col. Foodick, m.d.
5'-14" col. Carlton, m.d.
5'-15" col. American, m.d. on arm
6'-17" col. American Triple Purpose, m.d. on arm
7'-18" col. American Triple Purpose, m.d.
8'-17" col. Dreses, gear box m.d.
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 4 Foodick, 6" overhang, High Speed, m.d.
No. 15 Buffalo Floor Model, m.d.
No. ½, 1 & 2 Avey, m.d.
No. 1B Edlund, m.d., new
1 spindle No. 2MA6 Avey High Speed, m.d., 7½" overhang, 1943
No. 2B—6" H.D. Edlund H.S., m.d.
2 spindle Alton, belted m.d., 9" overhang
2 spindle No. 2 Avey High Speed, belted, m.d.
2 spindle No. 2B MAI Avey Production Type, m.d.
2 spindle Avey, size No. 1, Type B, style VHP, m.d., 8" overhang
2 spindle No. 3MA6 Avey High Speed, m.d.
2 spindle No. 2 Leland-Gifford High Speed, 8" overhang, m.d.
2 spindle Leland & Gifford High Speed Hydraulic Type, m.d.
No. 2LMS Leland-Gifford, single spindle, High Speed, m.d.
No. 2LMS Leland-Gifford, H.S. Hydraulic Feed, m.d.
3 spindle No. 2MA6 Avey High Speed, m.d.
3 spindle Leland & Gifford 21 LMS—High Speed, m.d., late
3 spindle Leland & Gifford High Speed, m.d.
4 spindle Leland & Gifford, m.d., on each spindle
6 spindle Leland & Gifford, m.d. on each spindle, No. 2 taper
6 spindle No. 1 Avey High Speed, m.d.
6 spindle Model M 1613 Pratt & Whitney In Line Vertical, m.d.

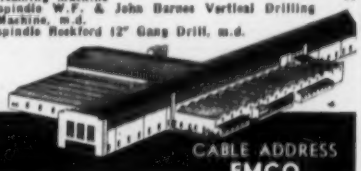
HORIZONTAL DRILLS

2 spindle Deep Hole Builders Iron Foundry Co., m.d.
3 way Natco Horizontal Drill, consisting of 3 E13 Hole units
No. 1½ Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 18x74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½ Bx105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
Model 416 W.F. & John Barnes, 2 spindle Hydraulic Deep Hole Drill, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d.
Natco Horizontal Drill, holesteel model, m.d., 1942
Natco Horizontal Drill, 2 opposed B4F2 Heads, 1943

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head
3 spindle 28" Cincinnati-Bickford Upright Drill, m.d., No. 4 M.T.
No. 924 Barnes Vertical Drilling, Boring, Facing & Reaming Machine
6 spindle W.F. & John Barnes Vertical Drilling Machine, m.d.
3 spindle Rockford 12" Gang Drill, m.d.

SEND FOR COMPLETE STOCK LIST



THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

CHOICE MACHINE TOOLS

CINN 5-60 Prod. Mill 1944
K&T 1404 Prod. Mill 1943
CINN 1-18 Prod. Mill 1951
SUNDSTRAND #1 Rigidmill 1954
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 15,000 cy. 1943
WARNER & SWASEY #3 Air Chuck & cyl.
GISHOLT #3, Air Chuck & Cyl. 1943

GISHOLT 1L, bar feed, C.S. turret, 1943
BULLARD 42", VTL Side Head
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl. Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 18x72 Plunge 1943
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #30B Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads DC drive
SOMMER & ADAMS Thread Mill, 18", H.I.S. 1943
BIGNALL & KEELER 6" pipe threader, 1940
BIGNALL & KEELER 12" pipe threader, 1940
BLISS 312 W, SSSC, 665 Tn, 14" stroke, 43"x50" bed, 1947

NOLL EQUIPMENT CO.
4535 St. Clair Ave., Cleveland 3, O.
EXpress 1-0700

BENNETT MACHINERY CO.

BORING MILLS, 4½" & 4" Sellers Floor
6" Ingersoll—very large
4" Sellers Table, Late
3" Univ. Triway, Thin
10' Niles, 2 Hds., PRT
52" King, 2 Hds., PRT
36" & 24" Bullard New Eras
GRINDERS, 18"x96" Cinci. Cyl. Pl.
No. 36 Hanchett 36" Vert. Rotary
No. 16 Blanchard 30" Vert. Rotary
36"x42" Pratt & Whitney Dia & Grf.
60" Hanchett Vert. Spin. No. 300
10"x29" B. & S. No. 1 Univ. '42
LATHES, 126" x 96" to 12" x 6'
TURRETS, Nos. 2H-10 & H5 Libbys
Nos. 3AL, 2L & 3 Gishelts
Nos. 2 & 2G Moreys, 1" capty.
MILLERS, Nos. 5 HP Cinci. Pl. & Univ. (2)
No. 22LU Van Norman '44
No. 2 Cinci. Dial, Univ. '45

375 Allwood Rd., Clifton, New Jersey
Phone: PRescott 9-8996 — N. Y. Phone: LOngacre 3-1222

McDONALD
USED MACHINERY

New Britain Model 16 Auto. Chucker 6-Sp.
Bridgeport Vert. Miller with Shaping Attach.
Brown & Sharpe No. 2 Surf. Grinder All Motorized
G&L 3" Bar Table Type Horiz. Boring Mill
Colburn 2-Spindle Box Col. Heavy Drill M.D. 20"
Niles (Timesaver Model) 32"x14' Bed Grd. Hd. M.D. Lathe 7' Centers.
Niagara 4' Power Shear ½" Cap. 20" Gap
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 8 Rect. Overarm Grd. Hd. Plain Horiz. Miller.
Baush 44" Vert. Boring Mill 2 heads.
American Vert. Hyd. Broach 48" str. 15 ton cap. 1947
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x72" and 18"x96" Plain st. Grinder.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W&S No. 2-A Grd. Hd. Univ. Turret Lathe
Bliss 200 T Cap. S.S.S.C.B. Grd. Press 8" Str. #77
Rivett No. 104 A.C. M.D. Internal Grinder, 1942.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers.
DoAll 16" Job Selector Metal Saw, 1956 Model.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box
Amer. 6' Radial Enol. Hd. 16" Col. 32-Sp. Speeds.
Amer. 4 Radial 12" Col. Enel. Hd.
Bliss #6N S.G. Stiles Type Press
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
B&S #2A Grd. Hd. Horiz. Univ. Miller.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 29" chuck.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Handey 16"x8' bed G.C.G. Lathe 1950.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 42" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
P & J #2 Auto. Prod. Miller, 2 Tables.
Cincinnati #2, #3 & #4 Centerless Grinders, all Motor Driven.
Bullard 24" Vert. Turret Lathe.
Lynd-Farquhar 25" stroke open-side Shaper Planer.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

EXCELLENT USED MACHINE TOOLS

No. 5 Abrasive 12"x60" surface grinder, horiz. spdl.
No. 2 Standard Brown & Sharpe vertical mill, new 1943.
No. 3 Gisholt ram type universal turret lathes (2), new 1942.
No. 5 Gisholt ram type universal turret lathe, new 1940. Arr. bar & chucking.
Models BL2416-BL3616 F & W Keller machines (3) one late
14" x 42" cc Hendey toolroom engine lathe, new 1940.
No. 5-48 Cincinnati hydromatic duplex mill, late
No. 4 Cincinnati high-power plain horizontal mill, serial E506J.
No. 4 Gallmeyer & Livingstone universal tool & cutter grinder, new 1941.
5' arm 13" col. Foodick "Economax" hydraulic radial drill, new 1943.

Free Illustrated Catalog of 1000 Machine Tools

MILES MACHINERY COMPANY
2039 E. GENESEE AVE.
SAGINAW, MICHIGAN
Telephone 2-3105

Automatic Tapping Machine, Snow #1UTB—Synchronized Index Table, new '55.

LOMART INDUSTRIES
199 Bleecker St., Brooklyn, N. Y. HY 1-2727

DIE CASTERS

2—#7 shot capacity zinc die casters, new 1940, mfg. by Stork Eng. complete hydraulic each $5500.00

MOHAWK MACHINERY INC.
Cooper & Apple Sts., Cincinnati 23, Ohio
MUlberry 1-1952

GOOD MACHINE TOOLS FOR SALE

VERTICAL BORING MILL
24" Spiral Drive BULLARD Vertical Turret Lathe

DRILLS
No. 2 MA 6 AVEY, 15" overhang, large table
No. 38 Edlund, 12" overhang

GEAR CUTTERS & HOBBERS
No. 61 FELLOWS Gear Shaper (older)
No. 61A FELLOWS Gear Shaper (late)
No. 36BM GOULD & EBERHARDT 3-spindle Bevel Gear Cutter
No. 36B GOULD & EBERHARDT Automatic Gear Cutter (late)
No. 725 FELLOWS High Speed Gear Shaper
No. 12 GLEASON Straight Bevel Gear Rougher
No. 60SM GOULD & EBERHARDT 3-spindle Vertical Gear Cutter (nearly new)

GRINDERS
No. 13 BROWN & SHARPE Grinder
No. 5 BRYANT Internal Hydraulic Hole Grinder (late)
16-28 BRYANT Hydraulic Internal Hole Grinder (late)
No. 16-38 BRYANT Internal Hydraulic Hole Grinder (late)
No. 24P26 BRYANT Hydraulic Internal Hole Grinder (late)
No. 50 HEALD Internal Grinder (late)
6"x18" CINCINNATI Plain Cylindrical Grinder Type EA, saddle (rebuilt and ready)
10"x48" LANDIS Plain Cylindrical Type C Grinder (late)
14"x72" Plain CINCINNATI Self-contained Grinder
14"x168" LANDIS type CH Plain Cylindrical Grinder (late)
16"x36" NORTON Type C (plunge) Cylindrical Grinder (late)
Model 76 RAP ROGERS Knife Grinder

MILLER
No. 5H K & T Plain (late)

PLANER
36"x36"x26' CINCINNATI Double Housing Hypro Planer (reversing motor drive)

TURRET LATHES
No. 1A WARNER & SWASEY Geared Head Way Type (older)
No. 2A WARNER & SWASEY Geared Head Way Type (older)

MISCELLANEOUS
14"x16' COULTER Automatic Screw Cutting Lathe (late type)
12" 8-Spindle BULLARD Mult-Au-Matic
6"x60" MODEL C PRATT & WHITNEY Thread Mill (rebuilt and ready)
No. 22 MURCHEY Single Head Threader (practically new)
18" DILL Universal Slotter (late)
No. 214 Besley Disc Grinder (30" disc)
Wicaco Oil Groover

THE MOTCH & MERRYWEATHER MACHINERY CO.

1250 East 222nd Street, Cleveland 17, Ohio • KEnmore 1-6300
DETROIT • PITTSBURGH • CINCINNATI • DAYTON

LATE TYPE

LARGE LATHE
60" x 45' c.c.

Mackintosh-Hemphill new 1943, 62' Bed, Heavy Duty, 2 Motor Driven carriages, geared head, screw-cutting, 60" face plate, 3 steady rests, wt. approx. 160,000#. Additional 25' bed section, will allow 70' between centers.

THOS. J. O'BRIEN, PRES.
Republic MACHINERY COMPANY
134 NORTH 3RD STREET • PHILADELPHIA 6, PA.
WAlnut 2-5813

DESIRABLE LATHE

36" x 17' centers, like new American latest design 12-speed geared head lathe, Serial No. 63277-41. Swing over the ways 40½". Swing over cross slide 28½"; Overall length 27'; Spindle speeds of 9 to 400 RPM. Power rapid traverse; 64 thread changes; 64 feeds; 2¼" hole thru spindle. American Taper nose spindle, Timken bearing, Taper attachment thread chasing dial, 10½" capacity steady rest, 17" diameter driving plate, 36" face plate, 32" 4 jaw Independent chuck, 20 HP Westinghouse 1200 RPM 220/440 3/60 motor.

Write for Complete Stock List.

JEFFERY & SON MACHINERY CO.
21006 St. Clair Ave., Cleveland 17, Ohio

MFR. OFFERS FOR SALE

250-ton Straight Side—Bliss Model 88
100-ton Straight Side—Clearing

Excellent condition, late, can be inspected under power. Complete specs on request.

H. C. NESSELSON, *Pur. Dept.*
1949 N. Cicero Ave., Chicago 39, Ill.
Berkshire 7-6000

PRACTICALLY NEW PRESSES

Niagara #611E, 175 Ton, Bed 72"x40"
Bliss #81½-48W, 110 Ton, Bed 48"x40"
Bliss-Toledo No. 83½J, cap. 140 tons, Bed 100"x48"
Bliss-Toledo No. 83½H, cap. 140 tons, Bed 84"x48"
Bliss No. 5-40 Double Action Toggle Draw Press, Strokes 20" and 31". Will draw and lift out 15", Bed 40"x40"

All Machines have Air Clutch and some have Air Cushions and Motor Driven Ram Adjustment. Still set up in Plant

"If it's machinery; we have it."

NATIONAL MACHINERY EXCHANGE
138 Mott St., N. Y. CAnal 6-2470

---

19 to 12 foot lengths
Any diameter up to 1¼ inch
All thread forms
All metals

For studs, hangers, worms, translating screws, etc.

20 Barclay St.
Eastern Machine Screw Corp., New Haven, Conn.

FOR SALE

MACHINE TOOL BUILDERS OFFER LINE OF RAM TYPE TURRET VERTICAL MILLING MACHINE.

Sale to consist of the entire business or any portion wanted as listed below:

Patterns, prints, jigs and fixtures, machine parts and assemblies, and rights to our milling machine line.

The line is well established throughout the United States by reputable dealers supplying us with a back log of orders.

BO-3285, AMERICAN MACHINIST
Classified Adv. Div., PO Box 12, NY 36, NY

FOR SALE

Keller Duplicator GG 1210

Bryant Hydraulic Internal Grinder 16C16

Bondycop Hydraulic Tracing Attachment Adaptable to any Lathe

Regent Fluid Motion Duplicator Table for Bridgeport Miller

J. G. TILP, INC.
Milltown Rd. Union, N. J.

"Key to Preventive Maintenance"

MACHINE TOOL RECONDITIONING
& the Art of Hand Scraping (new 2nd printing) —useful for design, shop & inspection work— Write for folder describing illustrated book.

MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabash Sts.
St. Paul 1, Minn.

COST REDUCTION PROGRAMS
- Organization
- Methods Improvement
- Job Evaluation
- Wage Incentives
- Budgetary Controls
- Diversification

WALLEY & ASSOCIATES
Management Consultants
Surveys — Installations — Training
25 Seminary Avenue Dayton 3, Ohio

SPECIAL SERVICE

Time Study Boards, Stop-Watches, Slide Rules, pedometers, counters, etc. Observation sheets in stock. Write for Free Sample Kit. O. P. Co., 5544 So. Homan, Chicago 29, Ill.

Index of PRODUCTS ADVERTISED

In This Issue

Abrasives, Coated 78-79

Accessories & Attachments (Machine Tool) 58, 217, 299, 311, 313, 314

Bearings 214, 271

Bending Machines 248

Books, Technical 259, 292

Boring, Drilling & Milling Machines (Horizontal) 14-15, 28-29, 40-41, 70-71

Boring Machines Internal ..... 2nd Cover, 39, 210-211

Broaching Machines 26-27, 265

Castings 206-207

Catalogs 230, 242

Centering Machines 311

Centers, Live 264

Centrifugal Machines 309

Chucks 164, 252, 298, 299, 315

Cleaning & Drying Machines & Supplies 235

Collets 164

Controls, Electrical 77, 88-89

Counters 32

Cut-Off Machines 68, 202, 213, 234, 244, 296

Cutters, Abrasive 216B, 244

Die Sets 64

Drilling Machines ..... 44-45, 51, 55, 59, 66-67, 201, Insert Facing 216, 288, 314

Drill Jig Bushings 98, 280, 307

Duplicators & Pantographs ..... Insert Bet. 32-33, 46-47

Dust Collectors 226

Electrical Parts & Equipment 77, 88-89

Electro Erosion (Electric Discharge & Ultrasonics) 291

Fabricating Methods & Services 276

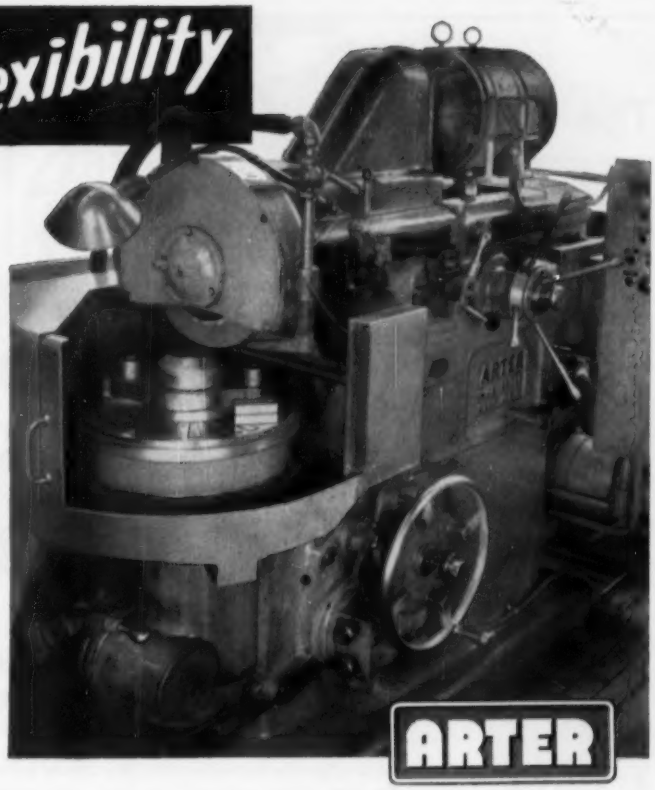
Fasteners 52-53, 261, 285

Files, Hand 209

Forgings 204-205

(*Continued on page* 308)

Flexibility



Arter Model D Rotary Surface Grinders are extremely flexible in their application to a wide range of surface grinding problems. By using special chucks, many seemingly difficult surface grinding jobs are made easy, permitting great savings in set-up time.

Here is one of General Electric's Arter Model D 16" Rotary Surface Grinders being used to grind punches for motor laminations. The chuck has a large diameter central hole to provide clearance for the shank.

The Arter Model D has great vertical capacity, hand and automatic feeds and a tiltable worktable. An arrangement for grinding work in a complete automatic push button cycle can be supplied.

For the best answer to your surface grinding problems — ask your Arter engineer.

ARTER GRINDING MACHINE COMPANY

WORCESTER 5, MASSACHUSETTS

Jigmatic Automatic Tape Controlled Positioning Table • Rotary Surface Grinders
Flat Circular Cutter Grinders • Internal Grinders • Cylindrical Grinders • Carbide Tool Grinders

AGENTS IN INDUSTRIAL CENTERS OF UNITED STATES AND CANADA

USE
GATCO ROTARY BUSHINGS
WITH
Your Boring Bars
FOR
ACCURACY
and
SAVE WEAR

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

ORIGINATORS OF THE ROTARY BUSHING

GATCO ROTARY BUSHING CO.

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

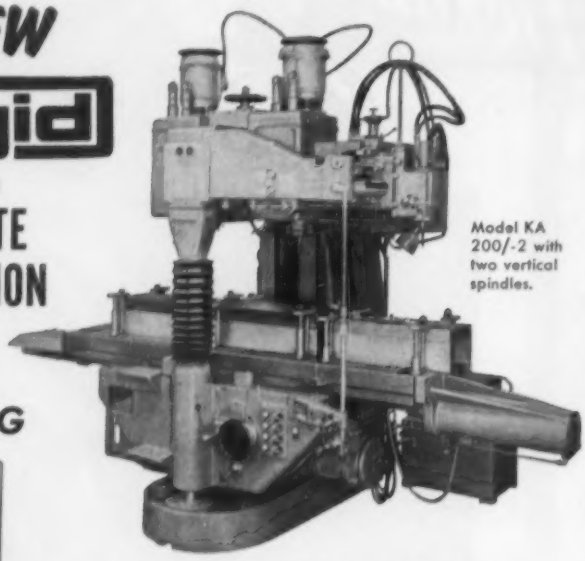
42324 ANN ARBOR ROAD, U.S. 12
PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

The **NEW**

Rigid

provides

COMPLETE AUTOMATION *in* **DIE SINKING**



Model KA 200/-2 with two vertical spindles.

Turbine blade forging die.

Aluminum compressor wheel 14" in diameter.

Greater Accuracy and Higher Finish Speed Up Production, Reduce Bench Time

The new RIGID die sinking and copy milling machines are hydraulically operated and *fully automatic*. RESULT—greater production speed, less operational supervision. And the high finish produced by these Swiss-made machines reduces time-consuming hand work to an absolute minimum.

The surface travel of the cutter remains constant regardless of variation in contour. Even vertical copying can be performed easily. RIGID Die Sinkers will maintain a normal working accuracy of ±.002" from master to work piece. Closer tolerances are also possible.

Six models provide a choice of one to six spindles. Optional equipment includes a 360° plus depth profiling head with working accuracy of ±.001" and a Reverse Image attachment to produce left and right parts from one master.

Interested? Write for bulletin.

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

CAN WE HELP?

American Machinist's Reader Service Department handles thousands of requests for additional information on advertised products, article reprints, and other assistance or service our readers want. Whenever, we can be helpful to *you* . . . write to:

Manager, American Machinist Reader Service
330 W. 42nd Street, New York 36, N. Y.

Index of PRODUCTS ADVERTISED

In This Issue

•

(Continued from page 307)

Gages, Instruments & Testing Equipment 49, 56, 94-95, 191, 197, 212, 220, 229, 246, 259, 280, 281, 288, 309, 310

Gear Cutting Machines 3, 6-7, 42, 251, 253

Gears, Speed Reducers, Motor Reducers 259, 279, 298

Gear Testers 3, 6-7, 292

Grinders—Cutter & Tool 63, 223, 262, 277, 294

Grindng Machines—Production 8-9, 12-13, 16-17, 18-19, 54, 63, 74-75, 277, 291, 294, 307

Grinding Wheels 21, 30-31, 78-79, 85, 216B, 228, 268-269

Heads: Drilling, Grindng & Tapping 231, 278, 288

Heat Treating Equipment & Supplies 219, 260, 315

Honing Machines 65

Hydraulic & Pneumatic Parts & Equipment 73, 233

Jig Borers 51

Jigs & Fixtures 231, 276

Keyseaters 278, 288, 301

Lathes, Automatic 36-37, 46-47, 199

Lathes, Engines Insert Bet. 32-33, 35, 215, Insert Facing 216, 227

Lathes, Turret 22-23, 62, Insert Facing 184

Lubricants, Cutting Fluids, Quenching Oils & Solvents 38, Insert Bet. 64-65, 80-81, 106, 189, 221, 276

Lubricating Systems & Equipment 185

Machines, Super Finishing 296

Marking Machines, Tools, & Supplies 92

Materials, Cutting & Forming 4th Cover, 236, 258, 284, 316

Materials of Manufacture 33, 76, 110, 166, 168, 204-205, 214, 222, 241, 243, 247, Insert Bet. 248-249, 257, 263, 278, 280, 287, 298

Materials Handling Equipment 20, 293, 310

Index of PRODUCTS ADVERTISED

In This Issue

•

Millers, Die Sinkers, Profilers ... 4-5, 61, 72, 308, 311, 312

Motors, Electrical ... 102, 216, 237, 297

Polishing & Buffing Machines & Supplies ... 280B

Power Transmission ... 195, 224-225, 245

Presses, Forging & Forming Equipment & Supplies ... 50, 68, 82, 91, 162, 203, 208, 213, 234, 248, 252, 255, 266-267, 278, 292, 295, 301

Production, Inventory & Tool Control ... 239

Pumps, Circulating ... 242

Riveting Machines ... 292

Saw Blades ... 48, 256, 264

Sawing Machines ... 48, 202, 256, 292, 296

Screw Machines; Chucking Machines ... Insert Bet. 32-33, 60, 83, 86-87, 240, 254

Shapers & Slotters ... 112, 270

Special Machine Tools ... 24-25, 57, 104-105, 276, 314

Spindles, Machine ... 193, 296

Tapping Attachments ... 164, 231

Tapping Machines ... 66-67, 264, 290, 301

Thread Cutting Machines ... 10-11

Thread Rolling Machines & Tools ... 10-11, 93

Tooling Set Up Equipment ... 275, 299

Tools, Cutting ... 3rd Cover, 34, 43, 69, 84, 90, 100, 109, 161, 187, 218, 230, 232, 236, 249, 260, 272, Insert Facing 280, 284, 288, 292

Tools, Portable ... 44-45

Used & Surplus Equipment ... 302-306

Vibration Control & Mountings ... 238

Vises ... 290, 296

Welding & Cutting Equipment & Supplies ... 184B, 226, 286

CUT HOT DIP TIN & ZINC COSTS WITH BARRETT HI-TORQUE DIRECT DRIVE CENTRIFUGALS

BARRETT WHIZO GALVANIZER

ACCELERATES to full speed in 3 to 5 seconds.

SNAPS excess metal from previously dipped parts.

UNIFORM COATING maintained within thousandths.

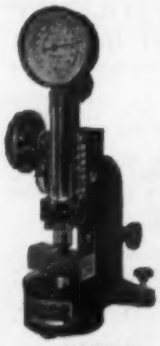
OVERSIZE BRAKE for instantaneous stop under foot control.

For full information write

THE LEON J. BARRETT CO.

1800 GRAFTON RD., WORCESTER, MASS.

"Continuing 108 years devoted exclusively to the design and manufacture of centrifugals."



MODEL D

SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard SINCE 1907

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

THE SHORE INSTRUMENT & MFG. CO., INC.

90-35B Van Wyck Exp.

Jamaica 35, N. Y.

MODEL C-2

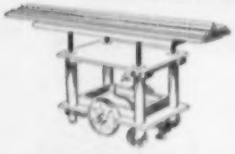
5603

NOW!

NEW *Convenience*
NEW *Capacities*
NEW *Designs*

PORTELVATOR®

The Handy HAMILTON Portable, Elevating Table



NEW provision for increasing table area!

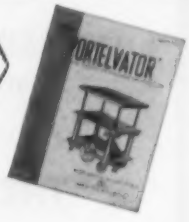
NEW provision for raising and lowering overhanging loads!

NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

More stamina, more versatile performance than ever before

NEW- FREE LITERATURE illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 830 South Ninth Street, Hamilton, Ohio.



IT'S A *Hamilton Tool*
USE IT WITH CONFIDENCE

REPRESENTED IN CANADA BY

Sykes Tool Corporation, Ltd., 123/131 York Street, Toronto

Sykes Tool Corporation, Ltd., 515 Bisson Street, Montreal

RANDALL and STICKNEY
Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2½" overall diameter, balanced dial 0-25-0 with .0005" graduations, ⅛" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is an R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gages Since 1896

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

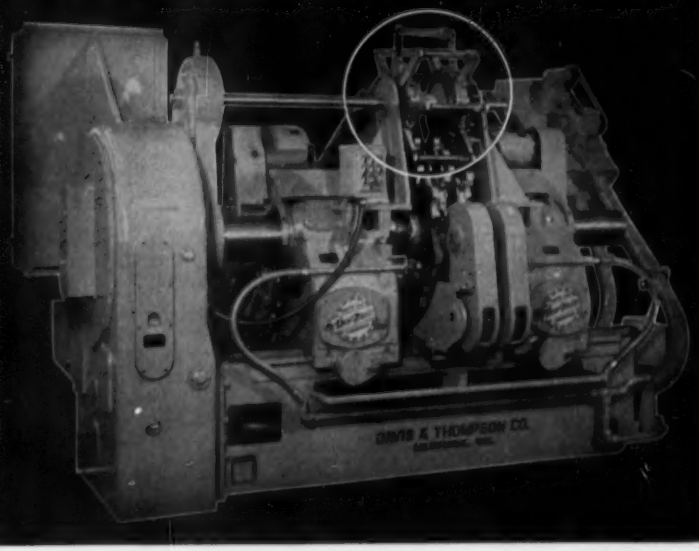
	Page
Abrasive Products Inc.	78-79
Alemite	185
Allegheny Ludlum Steel Corp.	316
Alvord-Polk Tool Company	292
American Brass Company	257
American Chain & Cable Co., Inc.	20, 220, 244
American Machinist	282-283
American Screw Company	285
American Steel & Wire Division	76
American Tool Works Co.	35
Ames Company, B. C.	246
Armco Steel Corporation	110
Armstrong Blum Mfg. Company	48
Armstrong Brothers Tool Company	58
Arter Grinding Machine Company	307
Atlantic Screw Works, Inc.	285
Avey Drilling Machine Company	66-67
Barnes Co., W. F. & John	24-25
Barrett Co., Leon J.	309
Bay State Abrasive Products Co.	268-269
Bay State Tap & Die Company	100
Beatty Machine & Mfg. Co.	292
Besly-Welles Corporation	249
Blake & Johnson Co.	285
Blanchard Machine Co.	54
Bliss Co., E. W.	91
Boston Gear Works	279
Brown & Sharpe Mfg. Co.	63
Bryant Chucking Grinder Company	60
Bryant Machinery & Engineering Co.	51
Buck Tool Company	252
Buhr Machine Tool Co.	104-105
Bullard Co.	Insert Facing 184
Bunting Brass & Bronze Co.	214
Butterfield Div. of Union Twist Drill Co.	69
Campbell Div. Andrew C. American Chain & Cable Co., Inc.	244
Carborundum Company	278, 280, 298
Carlton Machine Tool Company	55
Carolina Power & Light Company	280
Carpenter Steel Company	292
Central Screw Company	285
Century Electric Company	237
Chandler Tool Company	288
Chicago Pneumatic Tool Company	293
Chicago Tool & Engineering Co.	296
Cincinnati-Bickford Tool Co. Sub. Giddings & Lewis Machine Tool Co.	59
Cincinnati Gilbert Machine Tool Co.	70-71
Cincinnati Grinders Incorporated	16-17
Cincinnati Lathe & Tool Co.	Insert Facing 216
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. Grinding Wheels Division	85

INDEX TO ADVERTISERS

	Page
Cincinnati Shaper Company	112
Circular Tool Company	264
Cities Service Oil Co.	221
Cleereman Machine Tool Company	51
Climax Molybdenum Co. of New York	243
Colonial Broach & Machine Co.	265
Columbia-Geneva Steel Division	76
Columbus Die-Tool & Machine Co.	276
Cone Automatic Machine Co.	83
Consolidated Machine Tool Div. Farrel-Birmingham Co., Inc.	57
Continental Screw Company	285
Copperweld Steel Company	166
Cosa Corporation	308
Covel Manufacturing Company	277
Crucible Steel Co. of America	33
Custom Scientific Instruments Inc.	280
Danly Machine Specialties Inc.	96
Davis Keyseater Company	288
Davis & Thompson Co.	311
Denison Engineering Company	295
DoAll Company	202
Dow Chemical Co.	287
Dow Corning Corporation	276
Dreis & Krump Manufacturing Co.	248
Eastern Machine Screw Corporation	278
Eastman Kodak Co.	191
Elco Tool & Screw Corporation	285
Ellstrom Standards Div. Dearborn Gage Company	212
Erickson Tool Company	299
Erie Foundry Company	300
Errington Mechanical Laboratory	231
Ex-Cell-O Corporation	39, 98
Fafnir Bearing Company	271
Fawick Airflex Division Fawick Corporation	245
Federal Machine & Welder Company	50
Fellows Gear Shaper Company	6-7
Field & Son, Walter	314
Field Company, Inc., William H.	223
Ford Mfg. Co., M. A.	230
Forkardt K. G., Paul	298
Fosdick Machine Tool Company	201
Gardner Machine Company	21
Gatco Rotary Bushing Co.	307
Gear Grinding Machine Co.	251, 253
General Electric Apparatus Dept.	77, 250
Giddings & Lewis Machine Tool Company	14-15
Gisholt Machine Company	36-37
Gleason Works	3
Goddard & Goddard Co.	218
Goss & DeLeeuw Machine Company	240
Grant Gear Works Inc.	259
Grant Mfg. & Machine Company	292
Gray Co., G. A.	28-29
Great Lakes Screw Corporation	285
Greenfield Tap & Die Corp. Insert Facing	280
Greenlee Brothers & Co.	254
Grip Nut Company	296

(*Continued on page* 312)

. . . Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

Roto-Matic

Davis and Thompson Co.

4480 N. 124th St. MILWAUKEE 10, WISCONSIN

MATRA

— UNIVERSAL —

milling and boring attachment which can be fitted on Lathes

MATRA-WERKE G.M.B.H. FRANKFURT/M. 301 GERMANY

3-Dimensional panto-miller

For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard and special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller

Versatile and dependable for continuous service, the J & S "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Special Model 2B with 60" tracer arm available for low cost production of metal stamping dies.

Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin IT3.

WITH RIGHT ANGLE ADAPTOR

WITH FACE PLATE

AVAILABLE SIZES 7", 10", 14", 18", 24"

J&B EST 1870

JOHNSON & BASSETT, INC.

PRODUCTION TOOL DIVISION

WORCESTER, MASSACHUSETTS

From the *American Machinist* Library of *Tips for Top Shop Men*

EVERY time you try something new, somebody will call it "a dangerous precedent." Remember that everything new is either wrong or a dangerous precedent to the timid. If you let such reasoning sway you, you'll never do anything new. Only ideas that aren't "dangerous precedents" are the duds.

INDEX TO ADVERTISERS

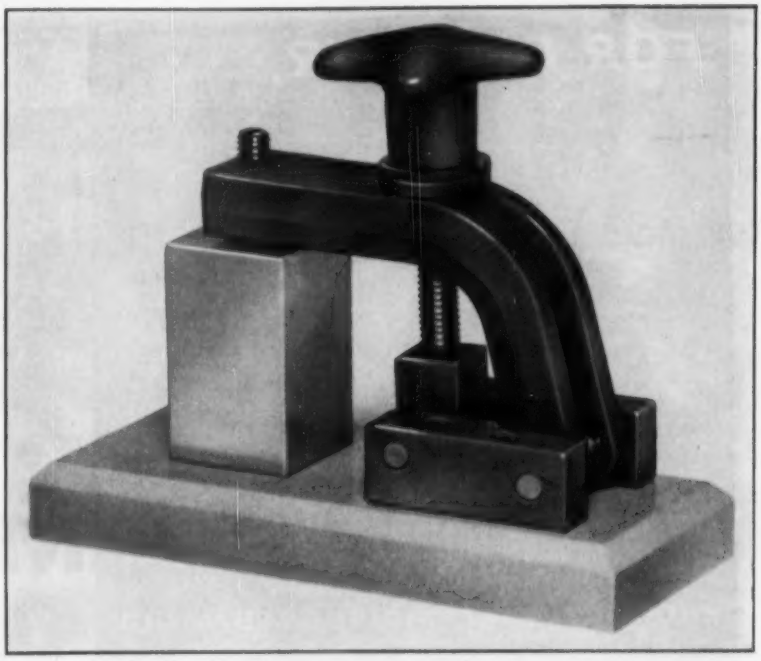
(*Continued from page* 311)

	Page
Halpern & Co., Wm., Vernon Devices	288
Hamilton Tool Company	310
Hannifin Corp.	252
Hardinge Brothers, Inc.	72
Harnischfeger Corp.	286
Harper Company, H. M.	285
Haynes Stellite Co., Div. Union Carbide & Carbon Co.	258
Heald Machine Co. Sub. Cincinnati Milling Machine Co.	2nd Cover
Henry & Wright Div. Emhart Mfg. Co.	266-267
Hisey-Wolf Machine Company	294
Hones, Inc., Charles A.	315
Howell Electric Motors Co.	297
Ideal Industries, Inc.	264
Ingersoll Milling Machine Co.	161
International Research & Development Corp.	238
J & S Tool Company	200
Jahn Manufacturing Co., B.	208
Johnson & Bassett Inc.	312
Jones & Lamson Machine Company	49, 62
Jones & Laughlin Steel Corp.	241
Kaufman Mfg. Co.	301
Kearney & Trecker Corp.	210-211
Kenco Mfg. Co.	278
Kennametal Inc.	284
Knight Machinery Co., W. B.	275
Lamina Dies & Tools Inc.	280
Lamson & Sessions Company	285
Landis Machine Company	10-11
Landis Tool Company	12-13
LaPointe Machine Tool Company	26-27
Lassy Tool Company	264
Lavallee & Ide Inc.	90
LeBlond Machine Tool Co., R. K.	40-41
Lees-Bradner Company	42
Lincoln Electric Company	226
Linde Air Products Div. Union Carbide Corp.	184 B
Linley Brothers Co.	313
Lodding, Inc.	313
Lodge & Shipley Company	68
Macklin Company	228
Madison Industries Inc.	272
Manhattan Rubber Div. Raybestos-Manhattan Inc.	216 B
Manheim Mfg. & Belting Company	195
Master Electric Company	102
Matra-Werke Gmbh	311
M.B.I. Export & Import Ltd.	290
McCaskey Industrial Div. Victor Adding Machine Company	239
McGraw-Hill Book Co., Inc.	259
McGraw Hill Publishing Co., Inc.	273-274

INDEX TO ADVERTISERS

	Page
Mechanite Metal Corp.	206-207
Mitts & Merrill	301
Moline Tool Company	314
Monarch Machine Tool Company	215
Mueller Brass Company	204-205
National Acme Company	86-87
National Lock Company	285
The National Screw & Manufacturing Company	285
New Britain Machine Company, The	Insert Bet 32-33
Nichols-Morris Corporation	61
Nicholson File Company	209
Nilson Machine Co., A. H.	255
Noble & Westbrook Mfg. Co.	92
Northfield Foundry & Machine Co.	278
Norton Company	18-19, 30-31
O. K. Tool Co., Inc.	3rd Cover
Oakite Products Inc.	235
Oliver Instrument Company	262
O'Neil-Irwin Mfg. Co.	234
Packer Machine Co.	280 B
Parker-Kalon Division, General American Transportation Corporation	285
Parker Majestic Inc.	193
Pheoll Manufacturing Company	285
Pope Machinery Corp.	296
Pratt & Whitney Co., Inc.	229, 232
Process Gear Company	298
Producto Machine Co.	64
Randall Co., Inc., Frank E.	310
Raybestos Manhattan Inc.	216 B
Raytheon Manufacturing Co. Equipment Marketing	291
Reed Rolled Thread Die Company	93
Reliance Electric & Eng. Co.	224-225
Reynolds Metals Company	Insert Bet. 248-249
Rodgers Hydraulic Inc.	203
Ruthman Machinery Company	242
Ryerson & Sons Inc., Joseph T.	168
Scherr Co. Inc., George	292
Schrader's Son, A., Div. Scovill Mfg. Co. Inc.	233
Scovill Manufacturing Company	285
Screw Research Association	285
Scully-Jones & Company	164
Sealol Corporation	217
Seneca Falls Machine Company	199
Shakeproof Div. Illinois Tool Works	285
Sheffield Corp.	197
Shore Instrument & Mfg. Co. Inc.	309
Sigourney Tool Company	288
Sinclair Refining Co.	189
Skil Corp.	44-45
Socony Mobil Oil Co., Inc. and Affiliates	38

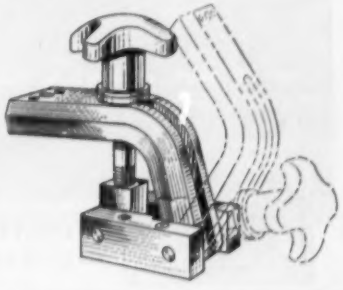
(Continued on page 314)



Infinite Variety

LODDING RETRACTING CLAMPS

Lodding Retracting Clamps lend themselves to infinite variation. Jaws are added to suit work. Tapped and clear holes are there for you to use. Lodding provides four types of action—and your own imagination is the limit to the variety of jaws you can add. Four sizes each of four styles—hand knob, hand cam, nut and air operated.



LODDING, INC.
Worcester 1, Massachusetts

FACTORY WAREHOUSES

Precision Tool Sales
417 E. Florence Ave.
Los Angeles 3, Calif.

Bagby Engineering Co.
1047 Forest Ave.
Evanston, Ill.

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, where large work belongs. You'll save money this way.

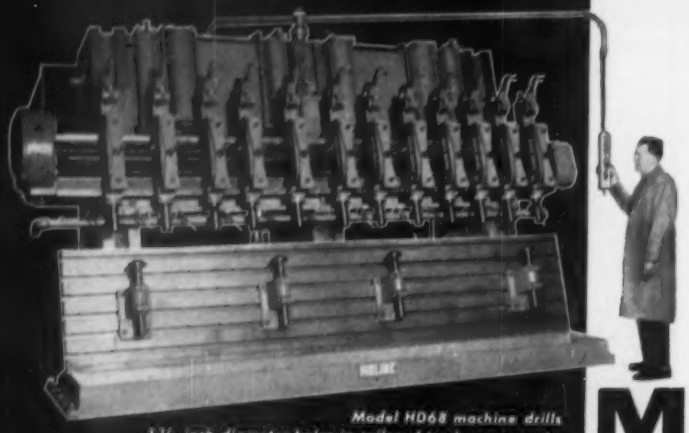
SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

LINLEY BROTHERS CO.
664 STATE ST. EXT., BRIDGEPORT 1, CONN.

FOR GREATER · · ·



Model HD68 machine drills 1 1/2 inch diameter holes in railroad track components.

MOLINE

PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

Representatives in principal cities.

104

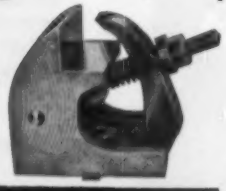
MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS

HART MILLING FIXTURES
Masters of A Thousand Set ups

eliminate expensive jigs and fixtures

Hold any shape stock aligned with miller, shaper, drill press or tapper. Famous for key-way setups. Value proven in large and small shops. 4 sizes.

Write for illustrated folder



WALTER W. FIELD & SON INC.
39 HAYWARD STREET CAMBRIDGE 42, MASS.

INDEX TO ADVERTISERS

(Continued from page 313)

	Page
South Bend Lathe Works	227
Southington Hdwe. Mfg. Company	285
Springfield Machine Tool Co.	74-75
Standard Oil Co. (Indiana)	80-81
Standard Pressed Steel Co.	52-53
Standard Tool Company	84
Staples Tool Company	34
Starrett Co., L. S., The	94-95
Sterling Bolt Company	285
Sterling Electric Motors Inc.	216
Stewart-Warner Corp.	185
Stupakoff Division of Carborundum Company	236
Sundstrand Machine Tool Company	46-47
Sundstrand Magnetic Products Co.	315
Sunnen Products Company	65
Sun Oil Company	Insert bet. 64-65
Surface Combustion Corp.	219
Sweets Catalog Service Div. F. W. Dodge Corp.	242
Taft-Peirce Mfg. Co.	56
Tannewitz Works, Inc.	292
Tennessee Coal & Iron Division	76
Texas Co.	106
Thielenhaus, Ernst, Maschinenfabrik	296
Thiokol Chemical Corporation	247
Timken Roller Bearing Company	4th Cover
Tomkins-Johnson Company	109
Torit Manufacturing Company	226
Triplex Machine Tool Corp.	296
Union Carbide & Carbide Corp.	184B, 258
Union Twist Drill Company	43
U. S. Steel Company	76
United States Steel Corporation	76

AMERICAN MACHINIST
ADVERTISING SALES STAFF

Atlanta 3 . . . M. H. Miller, 801 Rhodes-Haverty Bldg., Walnut 5778
Boston 16 . . . J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160
Chicago 11 . . . W. J. Haring, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800
Cincinnati 8 . . . R. H. Anderson, 1110 Delta Ave., East 1-6110
Cleveland 15 . . . Gifford W. Plume, Jr., R. H. Anderson, 1510 Hanna Bldg., Superior 1-7000
Dallas 2 . . . G. L. Jones, Jr., Adolphus Tower Bldg., Prospect 5064
Detroit 26 . . . W. J. Reichard, 856 Penobscot Bldg., Woodward 2-1793
Los Angeles 17 . . . H. L. Keeler, 1125 West Sixth St., Madison 6-9351
New York 36 . . . G. H. Krimsier, J. F. Jurascheck, B. C. Nicholas, 330 W. 42nd St., Longacre 4-3000
Philadelphia 3 . . . J. P. Tiebout, Architects' Bldg., 17th & Sansom Sts., Rittenhouse 6-0670
Pittsburgh 22 . . . K. Reeves Cook, 919 Oliver Bldg., Atlantic 1-4707
St. Louis 8 . . . P. F. Pritchard, 3615 Olive St., Continental Bldg., Jefferson 5-4867
San Francisco 4 . . . R. C. Alcorn, 68 Post St., Douglas 2-4600
England . . . Herbert Lagler, McGraw-Hill House, 95 Farringdon St., London, E. C. 4

INDEX TO ADVERTISERS

	Page
United States Steel Export Co.	76
United States Steel Supply Division	76
U. S. Tool Co., Inc.	82
Universal Screw Co.	285
V & O Press Company Div. Emhart Mfg. Co.	266-267
Van Keuren Company	259, 281
Van Norman Machine Co.	8-9
Vapor Heating Corp.	260
Vascaloy-Ramet Corporation	187
Veeder-Root Inc.	32
Verson Allsteel Press Co.	162
Vickers, Incorporated Div. of Sperry-Rand Corporation	73
Waldes Koh-I-Noor Inc.	261
Wales-Beech Corporation	285
Warner & Swasey Company	22-23
Waterbury Farrel Foundry & Machine Company	271
Webber Gage Company	289
Weldon Tool Company	260
Wells Manufacturing Co.	256
Westinghouse Electric Corp.	88-89
Wheelock Lovejoy & Co. Inc.	222
Wilson Mechanical Instrument Div. American Chain & Cable Co.	220
Wysong & Miles Company	213
Youngstown Sheet & Tube Company	263

CLASSIFIED ADVERTISING

F. J. Business, Ass't. Mgr.

EMPLOYMENT OPPORTUNITIES	301
EDUCATIONAL Books	306
BUSINESS OPPORTUNITIES Offered	306
EQUIPMENT (Used or Surplus New) For Sale	301-306

ADVERTISERS INDEX

Albert Tool & Gage Co.	304
Bennett Machinery Co.	305
Brownell Machine Tools Inc., Hazard	304
Dony Machinery, D. E.	304
Eastern Machinery Co., The	305
Eastern Machine Screw Corp.	306
Falk Machinery Co.	304
Hill-Clarke Machinery Co.	301
Hyman & Sons, Joseph	304
Jeffrey & Son Machinery Co.	308
Lomart Industries	305
Machine Tool Publications	306
McDonald Machinery Co.	305
Miles Machinery Co.	305
Mohawk Machinery Inc.	305
Morey Machinery Co. Inc.	303
Motch & Merryweather Machinery Co.	306
National Machinery Exchange	306
Nessleson, H. C.	306
Noll	305
Press & Shear Machinery Corp.	304
Republic Aviation	306
Tilp Inc., J. G.	306
United Machinery & Tool Corp.	302
Walley & Associates	306
Williams, E. H.	304

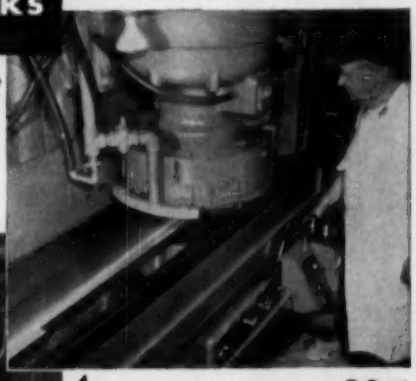
HOW TO CUT SET-UP TIME WITH Sundstrand Magnetic Chucks

Here are two more examples of the profitable application of Sundstrand magnetic chucks to grinding operations. Similar, profitable applications have been made to milling jobs.

No matter how you are holding work pieces now, in grinding and milling, talk to a Sundstrand engineer. There is no obligation for this service.

SET-UP TIME CUT 30%

12"x96" transverse pole magnetic table on vertical spindle grinder holds various sizes of H.S.S. broaching tools at an average savings in set-up time of 30% over former method.



SET-UP TIME CUT 20%

Four 10"x40" POWER-GRIP Chucks on a 24"x96" horizontal spindle surface grinder hold ways, way caps, valve plates, broach holders etc. The four chucks can be operated individually or as one complete unit. Set-up time averages 20% less than previous method.

GET MORE FACTS

Write for further information on holding work for both grinding and milling operations.

SUNDSTRAND POWER-GRIP

SUNDSTRAND Magnetic Products Co.

Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

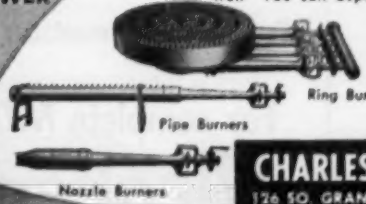
BUZZER • Reg. U. S. Pat. Off.

INDUSTRIAL GAS EQUIPMENT

BUZZER Equipment, a buy-word since 1911, provides the hottest and quickest heating . . . without blower or power. Wide range of turn down and heat control. You can depend on a BUZZER.

NO BLOWER OR OTHER POWER NEEDED

JUST CONNECT TO GAS SUPPLY

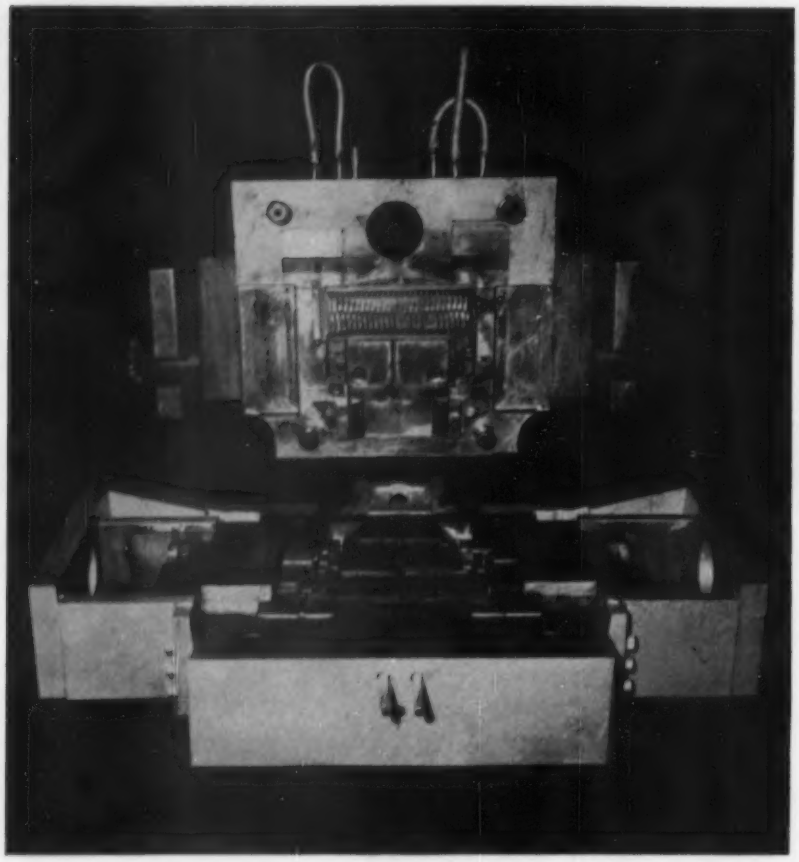


Send for complete BUZZER Catalog

CHARLES A. HONES, Inc.

126 SO. GRAND AVE., BALDWIN, L. I., N. Y.

BURNERS - FURNACES (Heat Treating, Melting, Soldering)



No matter what your DIE-CASTING JOB may be...

Accuracy calls for POTOMAC M Hot Work Die Steel

Write for BLUE SHEET on POTOMAC M

This concise four-page folder gives all needed handling and shop treatment details on Potomac M. Included is certified laboratory information on physical characteristics, and complete data on forging, annealing, hardening, tempering, etc. *Ask for your copy.*

ADDRESS DEPT. AM-83

In the precision casting of aluminum, POTOMAC M Hot-Work Die Steel is especially favored as the material for die-casting dies because its properties help assure accuracy of the steel itself *after* heat treatment. Die makers have found that size changes are held to a minimum. Dimensional stability is thus the *first* contribution that POTOMAC M makes to accuracy.

Production accuracy of the die after it is in service is maintained also by the resistance of POTOMAC M to wear, to heat checking, and to metal wash.

Allegheny Ludlum makes a complete line of steels for hot-work tooling of various kinds—so, whether your need is the mass producing of duplicate parts or fabricating a few of them, call up or write "A-L" every time for hot-work counsel or service or both. Just tell us your requirements.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For nearest representative, consult Yellow Section of your telephone book.

For complete **MODERN** Tooling, call

Allegheny Ludlum

WSW 4205

AL® FINE TOOL STEELS SINCE 1854

The OK TOOL Story

METAL CUTTING TOOLS . . . FROM ART TO SCIENCE

AT THE TURN of the century, The O. K. Tool Company initiated and lead the transition of tool making from an uncertain art to a precision manufacturing science.

This transition, still in process, took its first big step in the development by the O. K. Tool Company of a complete system of interchangeable inserted tool bits, preforged, preground to the exact geometry and prehardened.

For the first time in history, the American manufacturer could purchase for immediate use tool holders and a selection of bits for precise and efficient operation on lathes, planers, shapers and boring mills.

In 1901 O K Tool introduced the first tool holders with systematized tool bits . . . interchangeable, hardened, ground, ready for immediate use.

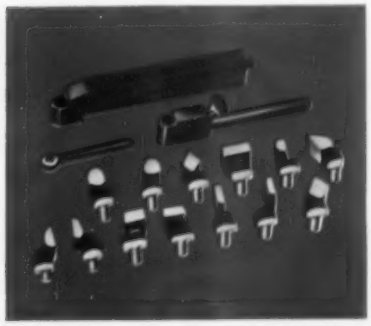
He had at his disposal the proper size and design of holder for his particular machine tool and a large selection in size and shape of interchangeable bits best suited for his operation.

Trade name steels of uncertain quality gave way to tools carefully specified.

Hand forging was replaced by accurate machine forging.

Precision grinding replaced off-hand grinding.

Blacksmith hardening went out, and precision controlled heat treating came in.



Tool sets for lathes, planers, shapers, boring mills, mean great savings to the metalworking industry. Forged alloyed steel holders conserve tool steel for tool bits. This combination better withstands the stress and strains of cutting action.

The industry had taken its first important step in its goal of supplying better tools for less money.

THE NEXT IMPORTANT STEP, again taken by The O. K. Tool Company, was the development of a milling cutter with inserted interchangeable teeth.

It was constructed essentially by locking O. K. high speed steel shank type tool bits around the periphery of a disc of alloyed cutter body steel. It was costly to manufacture and inefficient in operation but it was nevertheless the foundation that underlies every type of inserted blade cutter made in America.

Although it was improved from time to time, it became apparent that it was basically incapable of being developed to the extent where it could fully meet the growing demands of American Production.

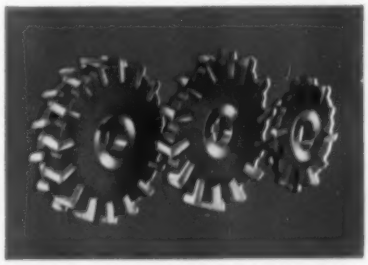
Several designs of inserted blade cutters appeared on the market, but they also lacked simplicity and rigidity.

THE O. K. TOOL COMPANY, under the Ritchie Patents, then developed the simplest, strongest and most rigid cutter ever made. It still holds that distinction today.

The blade of this cutter is a 5 degree tapered and serrated wedge which functions both as cutting unit and as locking device.

No pins, screws, wedges or other auxiliary locking devices are required. The blade is truly a self-locking cutting unit.

The O. K. cutter has been imitated but never equaled in design, quality and the engineering service that goes with every sale.

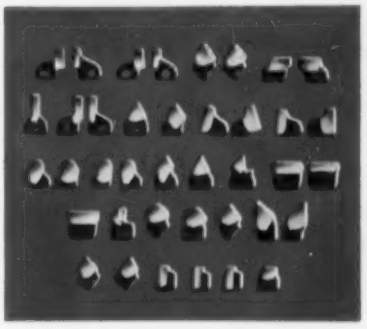


The O K line includes inserted blade milling cutters, end mills, face mills, reamers, counterbores, boring heads, and other multiple-bladed cutters.

This design is used in face mills, slotting cutters, half side mills, end mills, reamers, etc.

Since no auxiliary devices are required, it permits the maximum number of blades in any type of cutter. This often is the only type of blade possible in small diameter end mills and reamers and in special multi-diameter tooling so widely used today.

THE NEXT "FIRST" developed by the O.K. Tool Company was the development of the serrated tool bit. This was a natural extension of the serrated blade principle, to lathe, planer and shaper tools.



Shankless tool bits, prehardened and preground, come in 43 standard shapes and in various metal-cutting materials. Holders and bits are made in three sizes for medium, heavy and extra heavy-duty.

This permits side adjustment of the bit to compensate for wear, which permits maximum use of the tool material.

This series of tools is supplied in many sizes and shapes for maximum performance for light, medium and very heavy work.

The O. K. blades and bits are supplied in a variety of metal cutting materials to best fill all metal cutting requirements. They are available in several types of high speed steel, the cast alloys and the carbides.

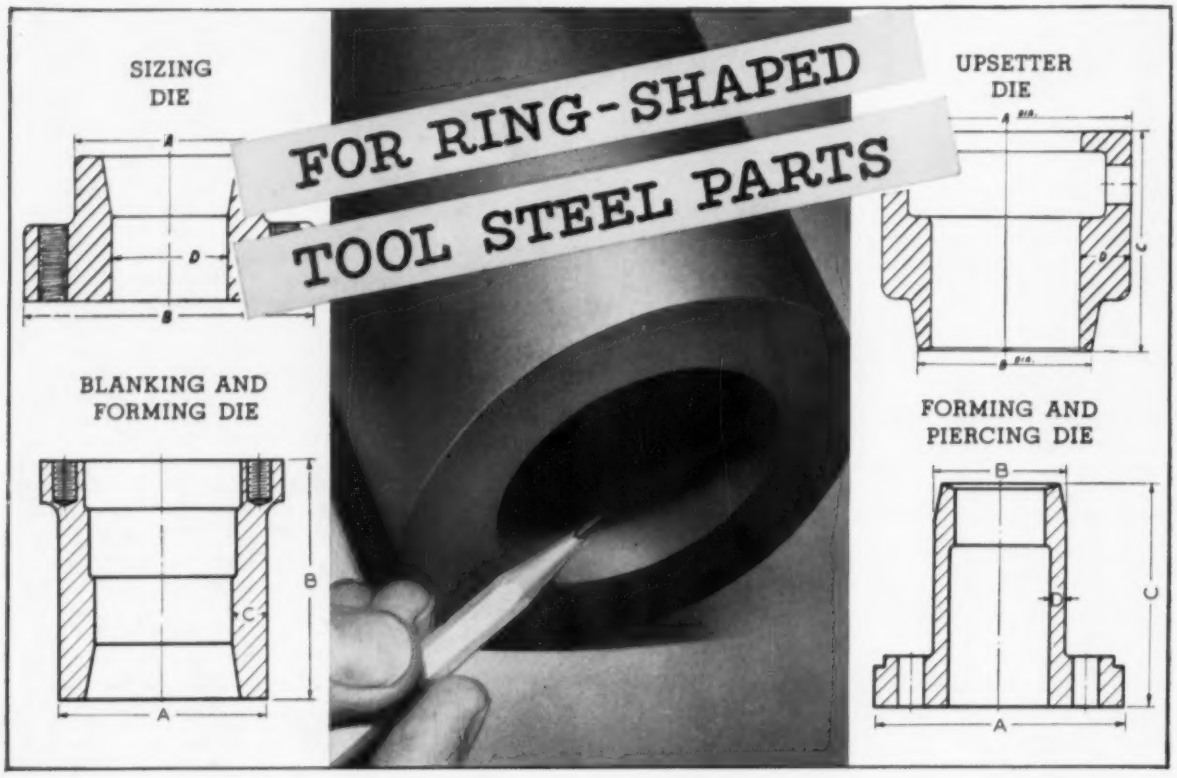
In the manufacture of cutting tools, the transition from art to science is still progressing. The arts established the foundation, and will never be abandoned, but it seems apparent that future guidance will be chiefly in the hands of science.

THE O K TOOL COMPANY INC 400 ELM STREET MILFORD NEW HAMPSHIRE

modern milling cutters for modern milling machines

A copy of the OK catalog 13, "Modern Milling Cutters for Modern Milling Machines" is yours on request.

reamers • boring heads • form cutters



New Graph-Mo Hollow-Bar eliminates drilling, machines 30% faster

MAKERS of ring-shaped tool steel parts who use Graph-Mo Hollow-Bar will tell you it speeds up production, cuts down waste, and saves steel. That's because the hole is already in it. There's no drilling, you start with finish boring.

What's more, you get all the proved advantages of Graph-Mo that have made it one of the most popular tool steels—excellent machinability, wearability, and stability.

Graph-Mo machines 30% faster than other tool steels and has a minimum tendency to scuff or gall. The combination of free-graphite and diamond-hard carbides in its structure gives it exceptional wearability. Users report that Graph-Mo outwears other tool steels on an average of 3 to 1.

Graph-Mo also is the most stable tool steel ever made. For instance, a Graph-Mo steel master plug gage showed less than 10 millionths of an inch in dimensional change after 12 years of use. And Graph-Mo responds uniformly to heat treatment, too.

If you make ring-shaped tool steel parts, make sure you get all the advantages of Graph-Mo Hollow-Bar. Sizes range up to 16″ O.D. with a variety of wall thicknesses. It's made by the specialists in fine alloy steels, The Timken Company.

Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and the Peninsular Steel Co. warehouses.

To find out more about this tool steel, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING